



Leeds City Region

Demographic Forecasts

Updating the Evidence

June 2015

edgeanalytics

Leeds Innovation Centre | 103 Clarendon Road | Leeds | LS2 9DF

0113 384 6087 | www.edgeanalytics.co.uk

Acknowledgements

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Executive Summary

Approach

- E1. The purpose of this analysis has been to present the latest demographic evidence for the Leeds City Region (LCR) to consider, updating the previous (March 2014) analysis.
- E2. New information released since the 2014 report was delivered, includes: the latest, 2012-based, population projections from ONS, with updated assumptions on migration, fertility and mortality; statistics from the 2012 and 2013 mid-year population estimates; the evaluation of all growth scenarios using assumptions from the 2012-based, 2008-based and 2011-based household models from the Department for Communities and Local Government (DCLG); and a new jobs-growth trajectory from the Yorkshire and Humber Regional Econometric Model (REM).
- E3. A suite of macro-level LCR demographic growth scenarios has been presented, including: the ONS 2010-based and 2012-based population projections; four alternative 'trend' scenarios and a 'natural change' scenario, which give explicit consideration to the continuation of historical trends in migration; two 'jobs-led' scenarios, to assess the demographic implications of the jobs-growth trajectories suggested by the December 2013 and December 2014 REM forecasts.
- E4. Important sensitivities have been presented which consider the impact of higher rates of economic participation upon the dwelling growth outcomes associated with anticipated jobs growth.
- E5. In addition, dwelling growth outcomes using previous household headship rate assumptions have been compared to those associated with the latest household model assumptions from DCLG's 2012-based release.
- E6. The POPGROUP (v.4) suite of demographic forecasting models has been used in the development of all scenarios, ensuring a robustness and consistency of approach. All data and assumptions have been presented in a transparent manner to enable the most effective interpretation of the issues and output under consideration.

Scenario Summary

- E7. With the application of the 2012-based household headship rates, the benchmark **SNPP-2012** scenario suggests an average annual dwelling requirement of 10,741 per year for the LCR. This sits within a wider range of outcomes, bounded by the, no-migration **Natural Change** scenario at 9,321 dwellings per year and the high-migration **Jobs-led REM Dec 2014** scenario at 14,364 per year.

Leeds City Region: dwelling growth requirements comparison

Scenario	HH-12 Average Annual Dwelling Requirement (2012–2031)
Jobs-led REM Dec 2014	14,364
<i>Jobs-led REM Dec 2014 SENS1</i>	<i>13,012</i>
Jobs-led REM Dec 2013	12,240
SNPP-2010	12,109
PG-10yr	12,049
PG-10yr-X	11,912
SNPP-2012	10,741
<i>Jobs-led REM Dec 2013 SENS1</i>	<i>10,724</i>
PG-5yr	10,598
PG-5yr-X	10,598
Natural Change	9,321

Notes:

HH-12 indicates that headship rate assumptions from DCLG's 2012-based household model have been applied.

Scenarios have been run with historical data included for the period 2001-2013.

Core scenarios are highlighted in bold, sensitivity scenarios are highlighted in italics.

- E8. The **SNPP-2012** benchmark suggests future growth that is reasonably consistent with the last five years of historical evidence but that is lower than the ten-year trends would suggest. This is primarily due to a lower annual net impact of migration in the **SNPP-2012**'s estimated future population growth for the LCR.
- E9. The latest REM economic forecasts imply a significant uplift in the average annual jobs growth anticipated for the LCR; +9,530 per year, compared to +7,004 per year in the 2013 round of forecasts. With no change in the commuting associations between the LCR's constituent areas

and with relatively modest adjustments to levels of economic participation in the older age-groups, these job growth forecasts suggest significantly higher population growth than the **SNPP-2012** benchmark and a larger annual dwelling requirement.

- E10. The annual dwelling growth requirements associated with the anticipated jobs growth falls substantially if higher rates of economic activity are maintained over the forecast period (**SENS1** scenarios). These sensitivities assume that a greater proportion of the 65+ age-groups will remain active in the labour force than has previously been the case.

Further Analysis for Consideration

- E11. The scenario evidence presented here has considered macro-level outcomes for the LCR. These outcomes hide the significant variations in inputs, assumptions and outputs for the LCR's constituent districts. Further analysis at a sub-regional level would be necessary to provide a full consideration of the demographic and economic influences that each district exerts upon the LCR aggregate picture.
- E12. The alignment of economic and demographic forecasts is a key consideration when evaluating the potential housing implications of anticipated growth in jobs. The inevitable shift towards an older age profile for the LCR implies that much higher rates of economic participation will be required in the 65+ age-groups if local labour forces are to be maintained without a more significant growth through net in-migration.
- E13. A more explicit identification of the REM jobs growth estimates for future economic participation rates and implied commuting balances would enable a closer alignment between the economic and demographic assessment of change; providing a more complete perspective to how these key parameters are expected to alter to meet anticipated jobs growth in the region.
- E14. Finally, the DCLG's latest 2012-based model has provided an important update on future household growth trajectories for the LCR. However, uncertainties remain over the likelihood and timing that the household headship rates for young adults might 'return' to pre-recession levels. Further analysis of age-specific headship rate evidence may be a consideration, preferably in conjunction with the additional 'household-type' projections which DCLG is due to release during summer 2015.

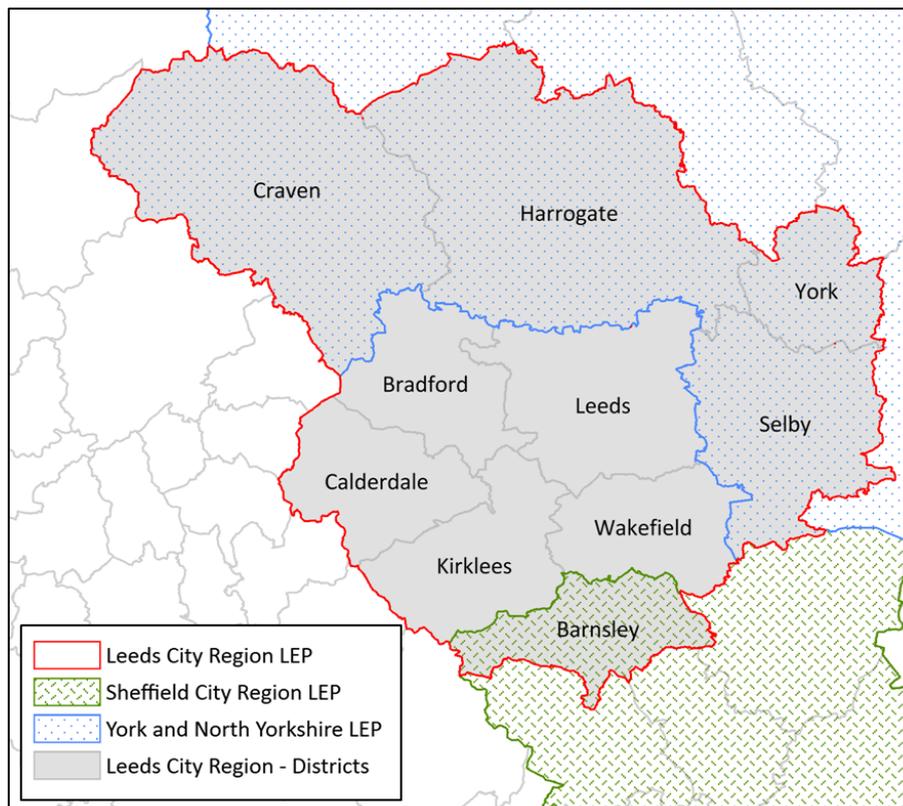
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Introduction

Context

- 1.1 The Leeds City Region (LCR) Local Enterprise Partnership (LEP) consists of ten local authorities; Barnsley, Bradford, Calderdale, Craven, Harrogate, Kirklees, Leeds, Selby, Wakefield and York. The LCR is overlapped to the north by the York and North Yorkshire LEP and to the south by the Sheffield City Region LEP (Figure 1).



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Figure 1: Local Authorities within the Leeds City Region (LCR) Local Enterprise Partnership (LEP)

- 1.2 In March 2014, Edge Analytics produced a range of demographic forecasts for the aggregate LCR, the outputs of which were incorporated within the Strategic Economic Plan (SEP) submission.

- 1.3 A range of macro-level scenarios were developed using POPGROUP (v3.1) technology, including:
- The 2010-based sub-national population projection (SNPP) from the Office for National Statistics (ONS);
 - Alternative ‘trend’ scenarios, based upon five-year and ten-year migration histories;
 - A ‘jobs-led’ scenario and a jobs-led ‘sensitivity’ scenario, underpinned by district-level employment forecasts from the December 2013 Yorkshire and Humber Regional Economic Model (REM).
- 1.4 The household-growth implications of each scenario were assessed using assumptions from both the 2008-based and 2011-based interim household projection models from the Department for Communities and Local Government (DCLG). Scenario outcomes were presented under an ‘Option A’ alternative, in which the 2011-based interim household headship rates were applied, and an ‘Option B’ alternative, in which the 2008-based household headship rates were applied.

Requirements

- 1.5 Edge Analytics has been commissioned by the LCR LEP to produce an updated suite of macro-level population, household and housing forecasts for the aggregate LCR, based around previous scenarios, but underpinned by the latest demographic inputs and economic assumptions. These include the latest official population and household projections from ONS and DCLG respectively.
- 1.6 The LCR LEP has also requested that an additional jobs growth forecast should be considered within the analysis, based on outputs from the December 2014 Yorkshire and Humber REM.
- 1.7 The scenarios have been developed using the latest version of POPGROUP (v.4), released in 2014. A number of changes have been made to the POPGROUP model to improve its operation and to ensure greater consistency with ONS forecasting methods. The most significant methodological change relates to the handling of internal migration in the POPGROUP forecasting model. The level of internal in-migration to an area is now calculated as a rate of migration relative to a defined ‘reference population’ (by default the UK population), rather than as a rate of migration relative to the population of the area itself (as in POPGROUP v3.1). This approach ensures a closer alignment with the ‘multi-regional’ approach to modelling migration that is used by ONS.

Approach

Official Guidelines

- 1.8 The development and presentation of demographic evidence to support local housing plans is subject to an increasing degree of public scrutiny. The National Planning Policy Framework (NPPF)¹ and Planning Practice Guidance (PPG)² provide guidance on the appropriate approach to the objective assessment of housing need.
- 1.9 These advocate that official statistics should provide a starting point for the evaluation of growth scenarios and that local circumstances, alternative assumptions and the most recent demographic evidence should be considered (PPG paragraphs 2a-015 and 2a-017). Evidence that links demographic change to forecasts of economic growth should also be assessed (PPG paragraph 2a-018).
- 1.10 The use of demographic models, which enable a range of growth scenarios to be evaluated, is now a key component of the objective assessment process. The POPGROUP suite of demographic models, which is widely used by local authorities and planners across the UK, provides a robust and appropriate forecasting methodology. For further information on POPGROUP, refer to Appendix A.
- 1.11 The choice of assumptions used within POPGROUP has an important bearing on scenario outcomes. This is particularly the case when trend projections are considered alongside population and household forecasts that are linked directly to anticipated jobs growth. The scrutiny of demographic assumptions is now a critical component of the public inspection process, providing much of the debate around the appropriateness of a particular objective assessment of housing need.
- 1.12 Edge Analytics has developed a range of macro-level scenarios for the LCR using POPGROUP (v.4) technology.

¹ <http://planningguidance.planningportal.gov.uk/blog/policy/>

² <http://planningguidance.planningportal.gov.uk/blog/guidance/>

Edge Analytics Approach

- 1.13 As the starting point of this assessment, the most recent, 2012-based SNPP for the aggregate LCR is presented, with an analysis of the underlying components of population change. These statistics are compared to previous population estimates and to the historical data on births, deaths and migration.
- 1.14 A number of alternative scenarios have been developed and are compared to the 2012-based SNPP 'benchmark'. These include:
- Four alternative 'trend' scenarios, to assess the demographic implications of a continuation of historical migration trends (from the most recent five and ten years).
 - A 'natural change' scenario, in which internal in- and out-migration flows are set to zero for each year in the forecast period.
 - Two 'jobs-led' scenarios, to assess the demographic implications of the jobs-growth trajectories suggested by the December 2013 and December 2014 REM.
 - A jobs-led 'sensitivity' scenario, to examine the impact of alternative economic activity rate assumptions upon the dwelling growth outcomes of the jobs-led scenarios.
- 1.15 All scenarios have been run to a 2031 horizon, with historical data included for the period 2001–2013. Scenario outcomes are presented for the 2012—2031 time period, which is consistent with Edge Analytics' original March 2014 report.
- 1.16 The household growth implications of the scenarios have been assessed using assumptions from the 2012-based household projection model, from DCLG. Sensitivities have also been run to examine the alternative household growth implications suggested by the 2008-based and the 2011-based interim household projection models.

Report Structure

- 1.17 The report is structured as follows:
- Section 2 provides headline statistics, illustrating the extent to which the LCR has been affected by demographic change since 2001. This section also reviews the demographic evidence that has become available since Edge Analytics' March 2014

report was completed, including the 2012-based population and household projections.

- Section 3 provides a summary of the scenarios that have been tested for the LCR, whilst Section 4 presents the outcomes of these scenarios in terms of population, household, dwelling and jobs growth.
- Section 5 summarises the report, providing an overview of the analysis and identifying a number of key issues for the LCR LEP to consider.
- Appendix A presents an overview of the POPGROUP methodology.
- Appendix B provides detail on the data inputs and assumptions used in the development of the POPGROUP scenarios.

2 LCR Profile

Mid-Year Population Estimates

- 2.1 The 2011 Census recorded a resident population of almost three million within the LCR, a 7.0% increase over the 2001–2011 decade (Table 1).

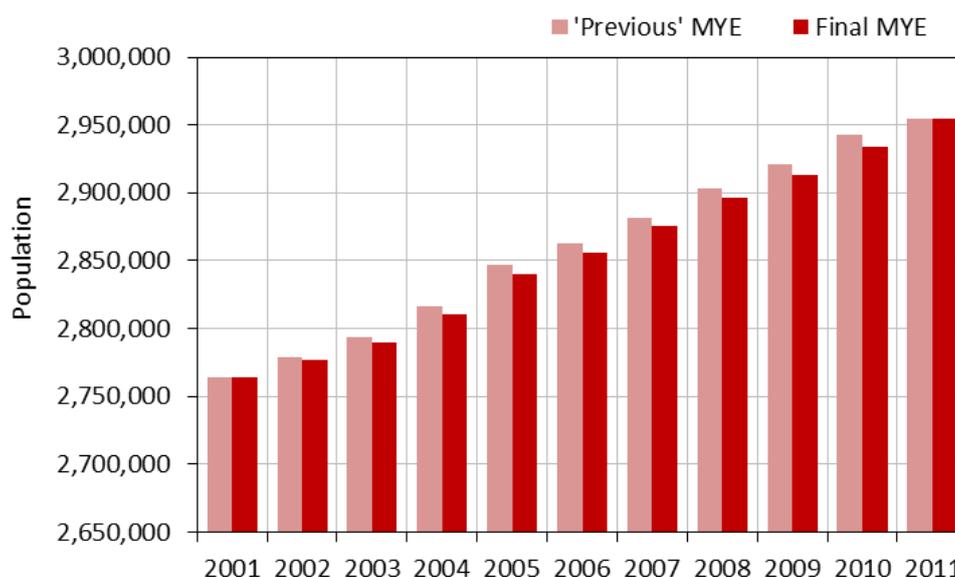
Table 1: Leeds City Region, population change, 2001–2011

Source: ONS, 2001 and 2011 Census

	2001	2011	Change	
			Absolute	Percentage
Population	2,759,196	2,952,057	192,861	7.0%

- 2.2 Between successive censuses, population estimation is necessary. These mid-year population estimates (MYEs) are derived through estimation of the components of population change (i.e. counts of births and deaths and counts of internal and international migration).
- 2.3 Following the 2011 Census, the 2002–2010 MYEs were ‘rebased’ to align them with the new population evidence³, ensuring the correct transition of the growth and age profile of the population over the 2001–2011 decade.
- 2.4 For the LCR, as a collection of ten districts, the 2011 Census population total proved to be *lower* than that suggested by the trajectory of growth from the previous MYEs, implying that previous MYEs *over-estimated* the scale of population growth evident within the LCR since the 2001 Census (Figure 2).

³ Revised Annual Mid-year Population Estimates, 2001 to 2010. ONS, December 2013
http://www.ons.gov.uk/ons/dcp171778_345500.pdf



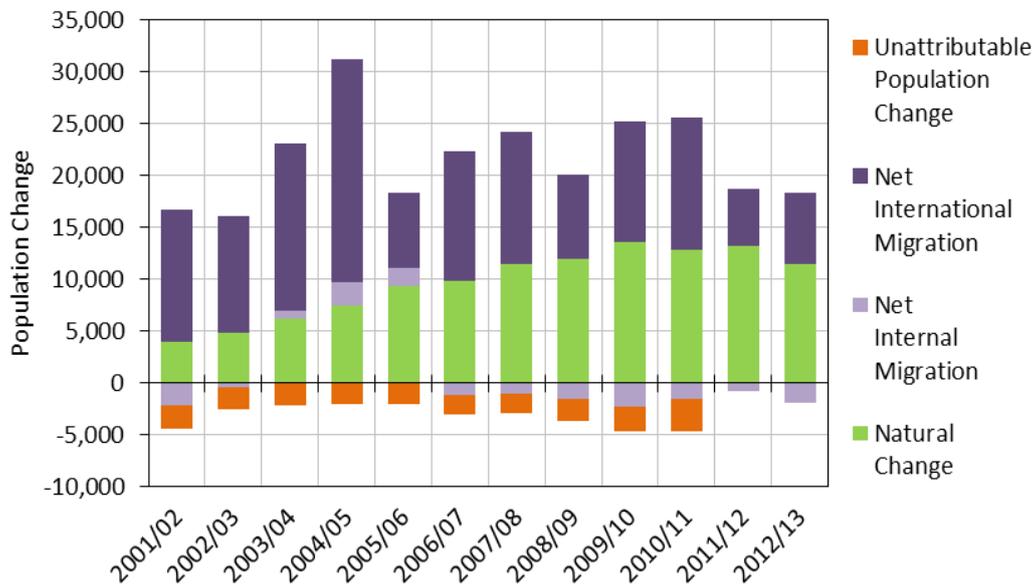
Source: ONS

Figure 2: Leeds City Region, aggregate mid-year population estimates, 2001—2011

Components of Population Change

- 2.5 The rebasing of the MYEs involved the recalibration of the components of population change for 2001/02—2010/11.
- 2.6 Between censuses, births and deaths are accurately recorded in vital statistics registers and provide a robust measure of 'natural change' (the difference between births and deaths) in a geographical area. Given that births and deaths are robustly recorded, and assuming that the 2001 Census provided a robust population count, the 'error' in the MYEs is due to the difficulties associated with the estimation of migration.
- 2.7 Internal migration is adequately measured through the process of GP registration, although data robustness may be lower where there is under-registration in certain age-groups (young males in particular). It is therefore most likely that the 'error' in the previous MYEs was associated with the mis-estimation of international migration, i.e. the balance between immigration and emigration flows to and from the LCR.
- 2.8 However, ONS has not explicitly assigned the MYE adjustment to international migration. Instead it has identified an additional 'unattributable population change' (UPC) component, suggesting it

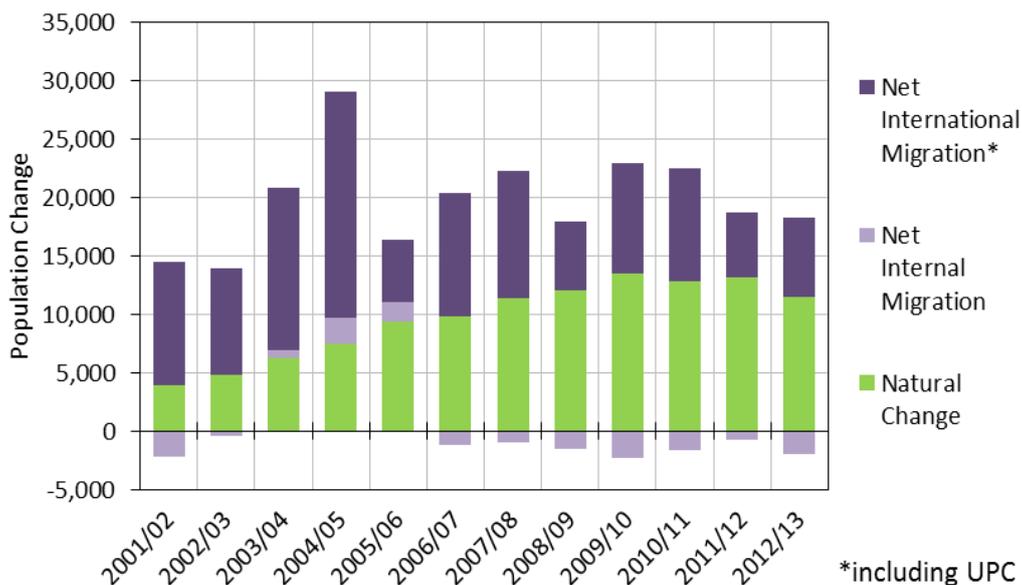
has not been able to accurately identify the source of the 2001–2011 ‘error’ in population estimation (Figure 3).



Source: ONS

Figure 3: Leeds City Region, components of population change, 2001/02–2010/11

- 2.9 For demographic analysis, the classification of 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.
- 2.10 With the assumption that the UPC element is assigned to international migration (for estimates up to 2011) and with the inclusion of statistics from the 2012 and 2013 MYEs (released by ONS in June 2013 and June 2014 respectively), a twelve-year profile of the ‘components of population change’ for the aggregate LCR is presented (Figure 4).
- 2.11 Natural change has had a positive impact upon population growth in the LCR since 2001/02, with an excess of births over deaths. Natural change increased between 2001/02–2009/10, plateauing thereafter. This contrasts to net internal migration (migration to and from other areas of the UK), which has varied over the 2001/02–2012/13 period. There was a net inflow of internal migrants in 2003/04–2005/06, reverting to a net outflow until 2012/13. Net international migration (the difference between immigration and emigration) has had a positive impact upon population growth in the LCR in all years since 2001/02.



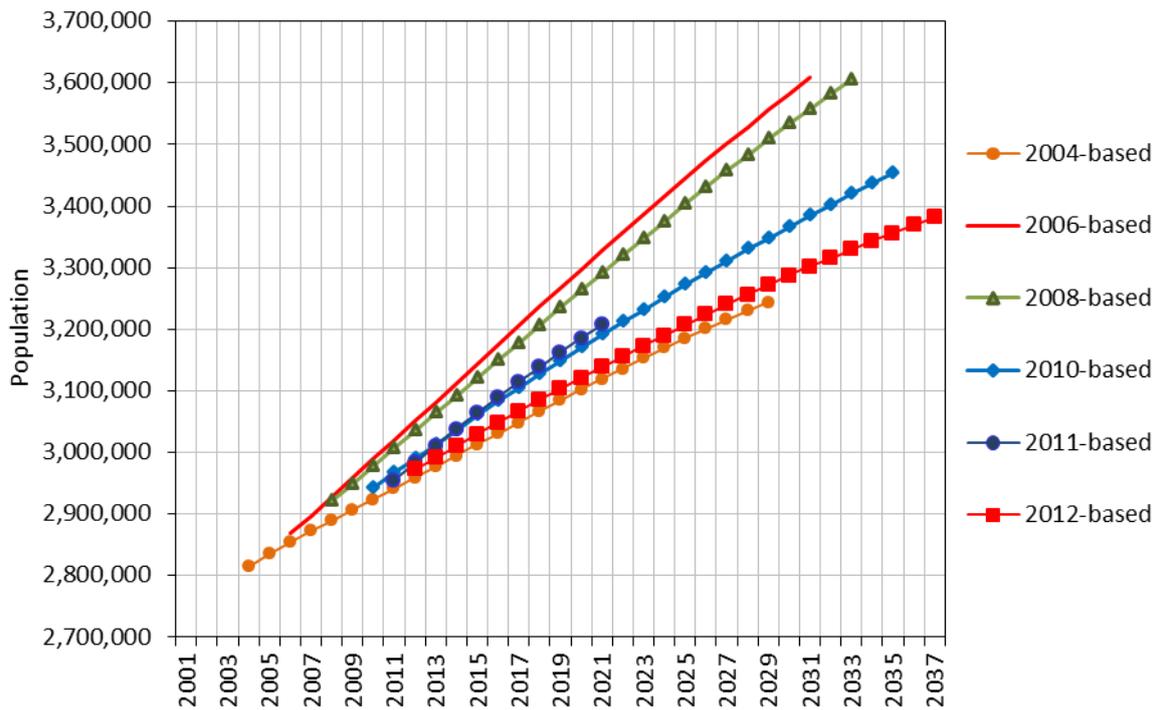
Source: ONS

Figure 4: Leeds City Region, components of population change 2001/02—2012/13, including UPC

Official Projections

2012-Based Sub-National Population Projection

- 2.12 In the development and analysis of population forecasts, it is important to benchmark any growth alternatives against the latest official population projection. The Edge Analytics March 2014 report presented the ONS 2010-based SNPP as the trend benchmark.
- 2.13 For this updated analysis, the 2012-based SNPP, released by ONS in May 2014, is the most recent official population projection. This projection is compared to earlier ONS population projections to illustrate the variation in projected growth outcomes for the aggregate LCR (Figure 5).
- 2.14 For the LCR as a whole, the 2012-based SNPP suggests a *lower* rate of population growth than the 2010-based projection. Under the 2012-based SNPP, the population of the LCR is projected to increase by 409,429 over the 2012–2037 projection period, a 13.8% increase. Under the 2010-based SNPP, the population was projected to increase by 17.4% over its 25-year projection period (2010–2035).



Source: ONS

Figure 5: Leeds City Region, official population projections

2012-Based Household Projection

- 2.15 The 2012-based household projections were released by DCLG in February/March 2015⁴. Underpinned by the 2012-based population projections, the new statistics provide a household growth projection for each local authority area in England for the period 2012–2037.
- 2.16 The methodological basis of the 2012-based household projections is consistent with that employed in the previous, 2008-based and 2011-based household projections⁵. In each, household projections have been derived through the application of projected household membership rates (also referred to as headship rates) to a projection of the private household population, disaggregated by age, sex and marital status.

⁴ 2012-based household projections in England, 2012 to 2037. DCLG 27th February 2015.

<https://www.gov.uk/government/statistics/2012-based-household-projections-in-england-2012-to-2037>

⁵ 2012-based household projections: methodology, DCLG 2nd March 2015.

<https://www.gov.uk/government/statistics/2012-based-household-projections-methodology>

2.17 Whilst methodologically similar to previous releases, the 2012-based household projections provide an important update on the 2011-based household projections, with the inclusion of the following new information (Source: p5 of DCLG Methodology):

- *2012-based sub-national population projections by sex and age that extend to 2037 (rather than to 2021 as was the case in the 2011-based interim projections).*
- *Household population by sex, age and relationship-status consistent with the 2011 Census (rather than estimates for 2011, which were derived from 2001 Census data, projections and national trends, as used in the 2011-interim projections).*
- *Communal population statistics by age and sex consistent with the 2011 Census (rather than the previous estimate, which were calibrated to the total communal population from the 2011 Census).*
- *Further information on household representatives from the 2011 Census relating to aggregate household representative rates by relationship status and age.*
- *Aggregate household representative rates at local authority level, controlled to the national rate, based on the total number of households divided by the total adult household population (rather than the total number of households divided to the total household population).*
- *Adjustments to the projections of the household representative rates in 2012 based on the Labour Force Survey (LFS).*

2.18 The household projection methodology consists of two distinct stages:

- ‘Stage One’ produces the national and local authority projections for the total number of households by age-group and relationship-status group over the projection period. The underpinning household representative rate projections have been derived using a combination of two fitted trends using data from historical Census points (1971, 1981, 1991, 2001 and 2011). All Stage One output has been released by DCLG.
- ‘Stage Two’ provides the detailed ‘household-type’ projection by age-group, controlled to the previous Stage One totals. Seventeen different household types are typically included in household model outputs. For the 2012-based household projections, DCLG has indicated that only partial information has so far been drawn

from the published 2011 Census data to derive the most detailed household representative rates. Stage Two assumptions and output, which provide the more detailed household-type statistics, are scheduled for release by DCLG in summer 2015.

3 Scenario Development

Introduction

- 3.1 There is no single definitive view on the likely level of population growth expected in the LCR; a combination of economic, demographic and national/local policy issues will ultimately determine the speed and scale of change. For local planning purposes, it is necessary to evaluate a range of growth alternatives to establish the most 'appropriate' basis for determining future housing provision.
- 3.2 Edge Analytics has used POPGROUP (v.4) technology to develop a range of macro-level growth scenarios for the LCR. For detail on the POPGROUP methodology, refer to Appendix A.
- 3.3 A total of nine 'core' scenarios have been developed for the aggregate LCR. These are accompanied by an additional 'sensitivity' scenario, which tests the impact of alternative economic activity rate assumptions upon dwelling growth outcomes.
- 3.4 In the following sub-sections, the scenarios are described and the broad assumptions specified. For further detail on the data inputs and assumptions, refer to Appendix B.

Core scenarios

Official Projections

- 3.5 In accordance with the PPG, the alternative scenarios are benchmarked against the most recent, 2012-based, 'official' population projection from ONS. The **SNPP-2012** scenario replicates this official population projection.
- 3.6 For comparison, the **SNPP-2010** scenario is presented. In this scenario, future population counts are provided by single-year of age and sex to ensure consistency with the trajectory of the ONS

2010-based SNPP. The SNPP-2010 scenario is scaled to ensure consistency with the start point of the 2012-based SNPP, following its designated growth trend thereafter. This does not alter the underlying assumptions or its growth trajectory.

Alternative Trend Scenarios

3.7 Four alternative 'trend' scenarios and a 'natural change' scenario have been developed to evaluate the impact of migration upon population and household growth:

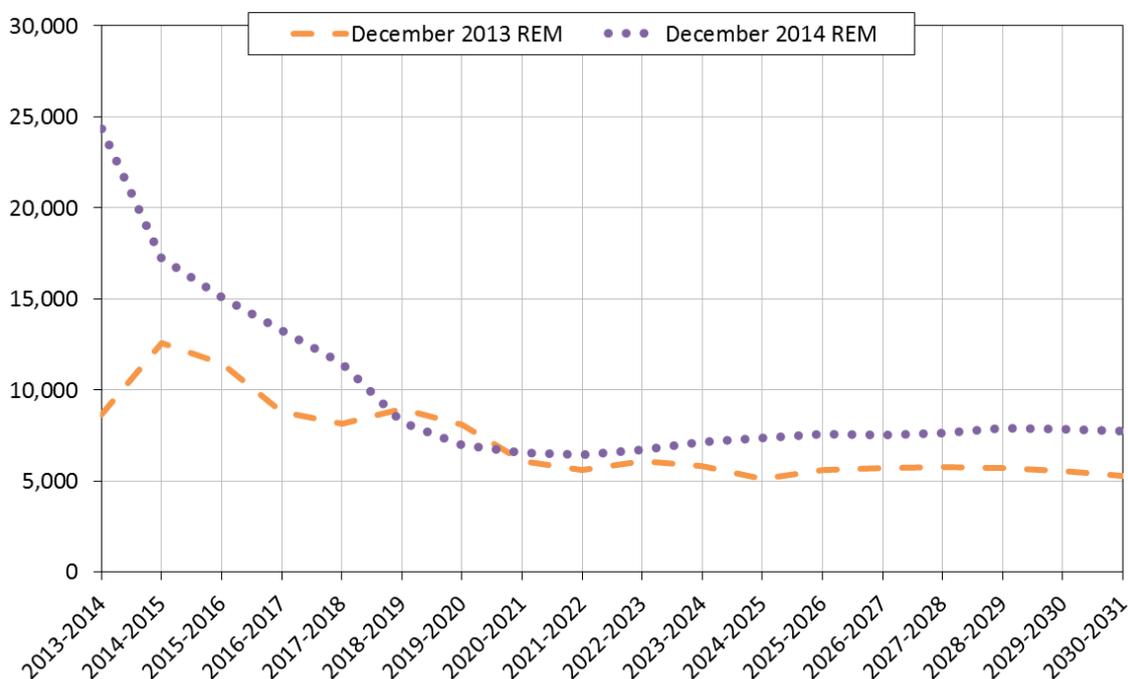
- **PG-5yr:** internal and international migration assumptions are based on the last five years of historical evidence (2008/09—2012/13). The UPC component is *included* with international migration.
- **PG-10yr:** internal and international migration assumptions are based on the last 10 years of historical evidence (2003/04—2012/13). The UPC component is *included* with international migration.
- **PG-5yr-X:** internal and international migration assumptions are based on the last five years of historical evidence (2008/09—2012/13). The UPC component is *excluded*.
- **PG-10yr-X:** internal and international migration assumptions are based on the last 10 years of historical evidence (2003/04—2012/13). The UPC component is *excluded*.
- **Natural Change:** internal migration flows and international migration counts are set to zero, providing an indication of the degree to which future population growth is driven by natural change.

Jobs-led Scenarios

3.8 In a 'jobs-led' scenario, population growth is linked directly to growth in the number of jobs available within an area. POPGROUP evaluates the impact of a jobs growth trajectory by measuring the relationship between the number of jobs in an area, the size of the labour force and the size of the resident population. Migration is used to balance the relationship between the size of the labour force and the forecast number of jobs. A higher level of net in-migration will occur if there is insufficient population and resident labour force to meet the forecast number of jobs. A higher level of net out-migration will occur if the population is too high relative to the number of jobs.

3.9 The following jobs-led scenarios have been produced to evaluate the impact of two alternative jobs growth trajectories for the aggregate LCR. Both trajectories are based on outputs from the Yorkshire and Humber REM (Figure 6):

- **Jobs-led REM DEC 2013:** population growth is linked to an average annual jobs growth target of 7,162, based on outputs from the December 2013 REM.
- **Jobs-led REM DEC 2014:** population growth is linked to an average annual jobs growth target of 9,827, based on outputs from the December 2014 REM.



Source: Yorkshire and Humber Regional Econometric Model

Figure 6: Leeds City Region, jobs growth underpinning the jobs-led scenarios

3.10 Three key data inputs are required to evaluate a jobs-led scenario, linking jobs growth to likely population change; economic activity rates for each year of the forecast period; a corresponding unemployment rate to estimate the portion of the labour force that remains out of work; and a commuting ratio, which estimates the balance between the number of jobs available and the size of the resident labour force.

3.11 In the other scenarios, POPGROUP uses the economic activity rate, unemployment rate and commuting ratio assumptions to derive the labour force and jobs implications of the suggested population growth trajectory.

- 3.12 In each of the core scenarios, the following economic assumptions have been applied:
- The 2011 Census economic activity rates for each LCR district, by sex and five year age-group (ages 16-74), have been applied in 2011, with uplifts applied (to 2020) to account for changes to the State Pension Age (SPA).
 - The 2011 Census commuting ratio for each LCR district has been applied throughout the 2014—2031 forecast period.
 - The 2014 unemployment rate for each LCR district has been incrementally reduced (to 2020) to account for economic recovery.
- 3.13 Further detail on these data items is provided in Appendix B.

Sensitivity Scenarios

- 3.14 Additional jobs-led (**REM DEC 2013** and **REM DEC 2014**) ‘sensitivity’ scenarios have been tested to examine the impact of alternative economic activity rate assumptions on population and household growth:
- **SENS1**: the 2011 Census economic activity rates for each LCR district, by sex, for the aggregate 16-74 age-group, have been applied in 2011, and remain constant, at this level throughout the forecast period. The commuting ratio and unemployment rate assumptions are unchanged from the ‘core’ scenarios.
- 3.15 The application of alternative economic activity rate assumptions, which maintain the overall rate of economic activity at its 2011 level, will result in a larger proportion of jobs being taken up by local residents, reducing the need for in-migration and therefore reducing the annual dwelling requirement.
- 3.16 A summary of the economic assumptions underpinning the core and sensitivity scenarios is presented in Table 2. Further details are provided in Appendix B.

Table 2: Leeds City Region: economic assumptions applied in the scenarios

	Core	SENS1
Economic Activity Assumptions		
The 2011 Census economic activity rates, by sex and five year age-group (ages 16-74), have been applied in 2011, with uplifts applied to account for State Pension Age changes.	✓	
The 2011 Census economic activity rates, by sex (for the aggregate 16-74 age-group), have been applied in 2011, and remain at this level throughout the forecast period.		✓
Commuting Assumptions		
The 2011 Census commuting ratio remains unchanged throughout the 2014—2031 forecast period.	✓	✓
Unemployment Assumptions		
The unemployment rate has been reduced to account for economic recovery to pre-recession levels.	✓	✓

Household Growth

- 3.17 The household growth implications of the core and sensitivity scenarios have been assessed using assumptions from the 2012-based DCLG household projection model. Sensitivities have also been run to examine the alternative household growth implications suggested by the previous 2008-based and 2011-based interim DCLG models.
- 3.18 In Edge Analytics' March 2014 analysis, the household-growth implications of each scenario were assessed using assumptions from both the 2011-based and 2008-based household projection models. For this updated analysis, the alternative headship rates have been applied to each scenario, producing **HH-12**, **HH-08** and **HH-11** outcomes:
- In the **HH-12** scenarios, the DCLG 2012-based headship rates have been applied.

- In the **HH-08** scenarios, the DCLG 2008-based headship rates have been applied, scaled to be consistent with the 2011 household total from the 2012-based DCLG projections, but following the original trend thereafter.
- In the **HH-11** scenarios, the DCLG 2011-based headship rates have been applied, scaled to be consistent with the 2011 household total from the 2012-based DCLG projections, but following the original trend thereafter and trended after 2021.

3.19 The dwelling growth implications of these different household growth trajectories are then assessed through the application of a vacancy rate for each LCR district (refer to Appendix B for further information).

4 Scenario Outcomes

Introduction

- 4.1 A detailed summary of the results of each scenario is provided in the form of a chart and an accompanying table of statistics (Figure 7). The chart illustrates the trajectory of population change resulting from each of the core scenarios, for the time-period 2001—2031. The table summarise the change in population and household numbers that result from each of the core and sensitivity scenarios, for 2012—2031. All scenarios have been run to a 2031 horizon, with historical data included for the period 2001—2013.
- 4.2 Within the table, the scenarios are ranked according to the estimated level of population change over the 2012—2031 period. The table illustrates the average annual net migration associated with the population change, plus the expected average annual dwelling and jobs growth based on the assumptions used in each scenario.
- 4.3 In Edge Analytics' March 2014 analysis, the household and dwelling growth implications of each scenario were assessed using assumptions from the 2008-based and 2011-based household projection models⁶. In this analysis, the dwelling growth outcomes for each of the core and sensitivity scenarios are presented, comparing the alternative dwelling requirements suggested by headship rate assumptions from the 2012-based household model (**HH-12**), the 2008-based household model (**HH-08**) and the 2011-based household model (**HH-11**) (Table 3).

⁶ Edge Analytics, Mar 2014, Leeds City Region Demographic Forecasts 2012-31, Phase 1 Report.

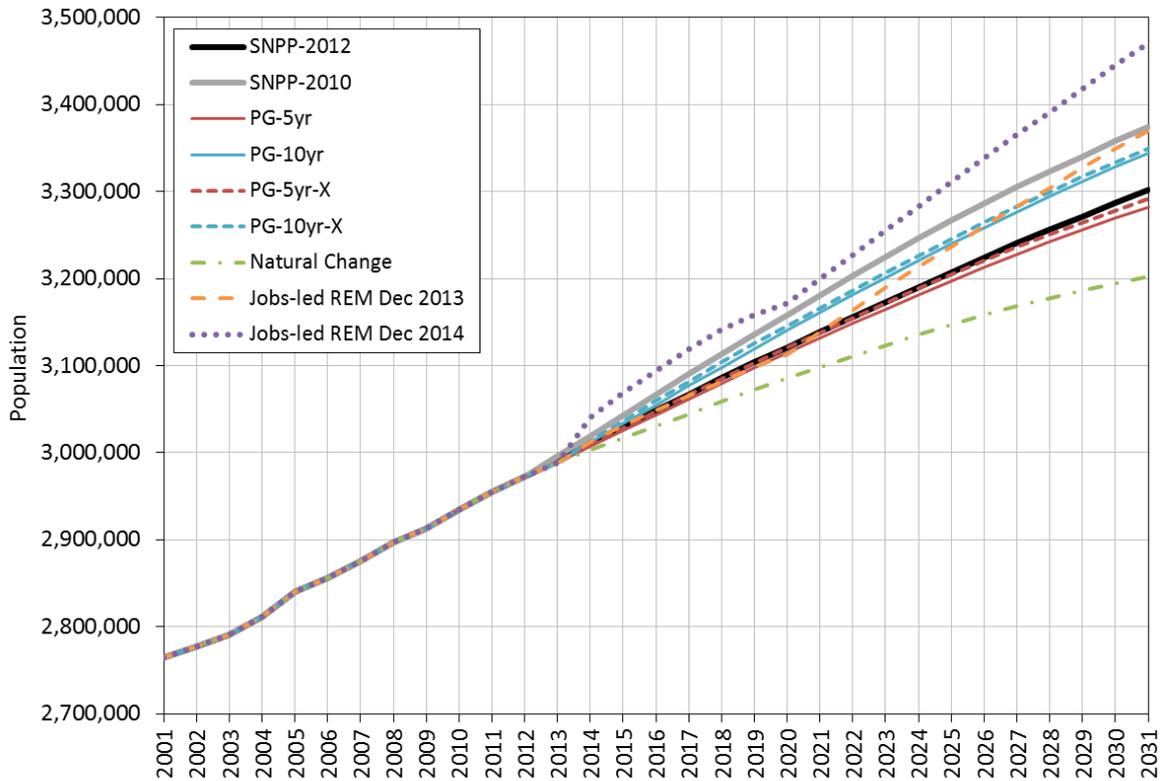
Scenario Growth Summary

- 4.4 The **SNPP-2012** scenario records total population growth of +11.1% for the aggregate LCR (2012–2031), with total household growth of +15.8%, an anticipated net migration impact of +4,363 per year, and an annual dwelling requirement of +10,741 dpa.
- 4.5 The **SNPP-2010** scenario records higher population growth (+13.5%) and household growth (17.8%), with an anticipated net migration impact of +6,708 per year, and an annual dwelling requirement of +12,109 dpa.
- 4.6 In the absence of any future impact of migration upon population change, the **Natural Change** scenario estimates an expected 7.7% growth rate to 2031; with a dwelling requirement of 9,321 per year over the forecast period.
- 4.7 Compared to the **SNPP-2012** benchmark, the **PG-5yr** and **PG-5yr-X** trend scenarios, which use the last five years of historical evidence to set future migration assumptions, suggest a lower rate of population growth (+10.4% and +10.7% respectively) in combination with lower net migration (+4,015 and +4,291 per year). These lower growth outcomes reflect net migration change that has been lower in the last five years compared to earlier years. The slightly higher 'X' scenario outcome reflects the effect of removing the UPC adjustment to the population estimates prior to 2011.
- 4.8 The **PG-10yr** and **PG-10yr-X** trend scenarios suggest a higher rate of population growth (+12.5% and +12.7% respectively) and higher net migration (+6,058 and +6,185 per year). This reflects the higher level of net migration experienced by the LCR over the historical ten-year period (2003/04—2012/13) (Figure 3 and Figure 4). Consequently, the **PG-10yr** and **PG-10yr-X** scenarios suggest higher household and dwelling growth.
- 4.9 The two **Jobs-led** scenarios evaluate the demographic implications of two alternative jobs growth forecasts from the Yorkshire and Humber REM (for December 2013 and December 2014).
- 4.10 The highest rate of population growth is suggested by the **Jobs-led REM Dec 2014** scenario (+16.8%), with higher annual net in-migration (+12,158) necessary to achieve the annual jobs growth target, given the assumptions that have been applied on economic activity, unemployment and commuting. The **Jobs-led REM Dec 2013** scenario, with its lower annual jobs

growth targets, suggests a lower rate of population growth (13.4%) and lower annual net in-migration (+12,240), using the same economic assumptions.

- 4.11 The dwelling requirement associated with the jobs-led outcomes is 14,364 per year for the **Jobs-led REM Dec 2014** scenario and 12,240 for the **Jobs-led REM Dec 2013** scenario.

Leeds City Region



Scenario	Change 2012 - 2031				Average per year		
	Population Change	Population Change %	Households Change	Households Change %	Net Migration	Dwellings	Jobs
Jobs-led REM Dec 2014	498,054	16.8%	262,000	21.1%	12,158	14,364	9,530
SNPP-2010	402,100	13.5%	221,082	17.8%	6,708	12,109	7,603
Jobs-led REM Dec 2013	397,216	13.4%	223,297	18.0%	7,819	12,240	7,004
PG-10yr-X	377,246	12.7%	217,465	17.5%	6,185	11,912	6,786
PG-10yr	371,759	12.5%	219,901	17.7%	6,058	12,049	6,192
SNPP-2012	328,930	11.1%	196,111	15.8%	4,363	10,741	4,859
PG-5yr-X	319,419	10.7%	193,513	15.6%	4,291	10,598	4,494
PG-5yr	310,046	10.4%	193,460	15.6%	4,015	10,598	3,935
Natural Change	229,457	7.7%	170,432	13.7%	256	9,321	1,567

Note: household and dwelling estimates are based on **HH-12** assumptions

Note: scenarios have been run with historical data included for the period 2001–2013.

Figure 7: Leeds City Region, core demographic and employment scenario outcomes (**HH-12**)

Sensitivity: Higher Economic Activity Rates

- 4.12 The economic activity rate assumptions applied in the 'core' scenarios attempt to account for increased economic participation associated with changes to SPA. However, even with these adjustments, the aggregate rate of economic activity for each district in the LCR declines over time due to the ageing effect upon population profiles (see Table 8 Appendix B).
- 4.13 These declining economic activity rates have an important impact upon the **jobs-led** scenario evaluation, increasing the requirement for net in-migration to meet jobs growth targets and thus increasing the average annual dwelling requirement.
- 4.14 Additional scenarios have been run which test the sensitivity of dwelling growth outcomes to higher economic activity rate assumptions.
- 4.15 For each of the two **Jobs-led** scenarios, alternative economic activity rate assumptions have been applied, which maintain the overall rate of economic activity at its 2011 level (**SENS1**). This results in the maintenance of a larger resident labour force and a larger proportion of new jobs being taken up by local residents, reducing the need for in-migration and reducing the annual dwelling requirement.
- 4.16 With the application of headship rate assumptions from the 2012-based DCLG household model, the **Jobs-led REM Dec 2013 SENS1** and **Jobs-led REM Dec 2014 SENS1** scenarios suggest an average annual dwelling requirement of 10,724 per year and 13,012 per year respectively (Table 3).

Table 3: Leeds City Region: SENS1 dwelling growth comparisons

Scenario	HH-12 Average Annual Dwelling Requirement (2012–2031)
Jobs-led REM Dec 2014	14,364
<i>Jobs-led REM Dec 2014 SENS1</i>	<i>13,012</i>
Jobs-led REM Dec 2013	12,240
<i>Jobs-led REM Dec 2013 SENS1</i>	<i>10,724</i>

Note: scenarios have been run with historical data included for the period 2001–2013.
Note: core scenarios are highlighted in **bold**, sensitivity scenarios are highlighted in *italics*.

4.17 These dwelling growth outcomes are a significant reduction on the core scenario estimates. The higher economic activity rates imply a local labour force that maintains its size over the plan period without the need for such significant net in-migration. However, in doing so, a much higher number of workers would need to be drawn from the 65+ age-groups compared to previous years.

Sensitivity: Household Headship Rates

4.18 With the application of the 2012-based household headship rates, average annual dwelling requirements suggested by the core and jobs-led sensitivity scenarios range from +9,321 (**Natural Change**) to +14,364 (**Jobs-led REM Dec 2014**) over the 2012–2031 time period (Table 4).

4.19 Compared to the **HH-08** and **HH-11** outcomes, the general pattern resulting from the **HH-12** outcomes is for higher dwelling growth compared to the **HH-11** scenarios (reflecting a higher rate of projected household formation), but a lower rate of dwelling growth compared to the **HH-08** scenarios (reflecting a lower rate of projected household formation) (Table 4).

Table 4: Leeds City Region: dwelling growth scenarios

Scenario	Average Annual Dwelling Requirement (2012–2031)		
	HH-08	HH-11	HH-12
Jobs-led REM Dec 2014	15,732	12,931	14,364
<i>Jobs-led REM Dec 2014 SENS1</i>	<i>14,366</i>	<i>11,633</i>	<i>13,012</i>
Jobs-led REM Dec 2013	13,555	10,817	12,240
SNPP-2010	13,385	10,942	12,109
PG-10yr	13,083	10,480	12,049
PG-10yr-X	13,128	10,444	11,912
SNPP-2012	12,042	9,381	10,741
<i>Jobs-led REM Dec 2013 SENS1</i>	<i>12,023</i>	<i>9,355</i>	<i>10,724</i>
PG-5yr	11,832	9,263	10,598
PG-5yr-X	11,944	9,318	10,598
Natural Change	10,564	8,415	9,321

Note: scenarios have been run with historical data included for the period 2001–2013.
 Note: core scenarios are highlighted in **bold**, sensitivity scenarios are highlighted in *italics*.

5 Summary

Approach

- 5.1 The purpose of this analysis has been to present the latest demographic evidence for the LCR to consider, updating the previous (March 2014) analysis.
- 5.2 New information released since the 2014 report was delivered, includes: the latest, 2012-based, population projections from ONS, with updated assumptions on migration, fertility and mortality; statistics from the 2012 and 2013 mid-year population estimates; the evaluation of all growth scenarios using the 2012-based, 2008-based and 2011-based DCLG household models; and a new jobs-growth trajectory from the REM.
- 5.3 A suite of macro-level LCR demographic growth scenarios has been presented, including:
 - The ONS 2010-based and 2012-based population projections
 - Four alternative ‘trend’ scenarios and a ‘natural change’ scenario, which give explicit consideration to the continuation of historical trends in migration.
 - Two ‘jobs-led’ scenarios, to assess the demographic implications of the jobs-growth trajectories suggested by the December 2013 and December 2014 REM forecasts.
- 5.4 Important sensitivities have been presented which consider the impact of higher rates of economic participation upon the dwelling growth outcomes associated with anticipated jobs growth.
- 5.5 In addition, dwelling growth outcomes using previous household headship rate assumptions have been compared to those associated with the latest household model assumptions from DCLG’s 2012-based release.
- 5.6 The POPGROUP (v.4) suite of demographic forecasting models has been used in the development of all scenarios, ensuring a robustness and consistency of approach. All data and assumptions

have been presented in a transparent manner to enable the most effective interpretation of the issues and output under consideration.

Scenario Summary

- 5.7 With the application of the 2012-based household headship rates, the benchmark **SNPP-2012** scenario suggests an average annual dwelling requirement of 10,741 per year for the LCR. This sits within a wider range of outcomes, bounded by the, no-migration **Natural Change** scenario at 9,321 dwellings per year and the high-migration **Jobs-led REM Dec 2014** scenario at 14,364 per year (Table 5).

Table 5: Leeds City Region: Dwelling growth requirements comparison

Scenario	HH-12 Average Annual Dwelling Requirement (2012–2031)
Jobs-led REM Dec 2014	14,364
<i>Jobs-led REM Dec 2014 SENS1</i>	<i>13,012</i>
Jobs-led REM Dec 2013	12,240
SNPP-2010	12,109
PG-10yr	12,049
PG-10yr-X	11,912
SNPP-2012	10,741
<i>Jobs-led REM Dec 2013 SENS1</i>	<i>10,724</i>
PG-5yr	10,598
PG-5yr-X	10,598
Natural Change	9,321

Note: scenarios have been run with historical data included for the period 2001–2013.

Note: core scenarios are highlighted in **bold**, sensitivity scenarios are highlighted in *italics*.

- 5.8 The **SNPP-2012** benchmark suggests future growth that is reasonably consistent with the last five years of historical evidence but that is lower than the ten-year trends would suggest. This is primarily due to a lower annual net impact of migration in the **SNPP-2012**'s estimated future population growth for the LCR.
- 5.9 The latest REM economic forecasts imply a significantly uplift in the average annual jobs growth anticipated for the LCR; +9,530 per year, compared to +7,004 per year in the 2013 round of

forecasts. With no change in the commuting associations between the LCR's constituent areas and with relatively modest adjustments to levels of economic participation in the older age-groups, these job growth forecasts suggest significantly higher population growth than the **SNPP-2012** benchmark and a larger annual dwelling requirement.

- 5.10 The annual dwelling growth requirements associated with the anticipated jobs growth falls substantially if higher rates of economic activity are maintained over the forecast period (**SENS1** scenarios). These sensitivities assume that a greater proportion of the 65+ age-groups will remain active in the labour force than has previously been the case.

Further Analysis for Consideration

- 5.11 The scenario evidence presented here has considered macro-level outcomes for the LCR. These outcomes hide the significant variations in inputs, assumptions and outputs for the LCR's constituent districts. Further analysis at a sub-regional level would be necessary to provide a full consideration of the demographic and economic influences that each district exerts upon the LCR aggregate picture.
- 5.12 The alignment of economic and demographic forecasts is a key consideration when evaluating the potential housing implications of anticipated growth in jobs. The inevitable shift towards an older age profile for the LCR implies that much higher rates of economic participation will be required in the 65+ age-groups if local labour forces are to be maintained without a more significant growth through net in-migration.
- 5.13 A more explicit identification of the REM jobs growth estimates for future economic participation rates and implied commuting balances would enable a closer alignment between the economic and demographic assessment of change; providing a more complete perspective to how these key parameters are expected to alter to meet anticipated jobs growth in the region.
- 5.14 Finally, the DCLG's latest 2012-based model has provided an important update on future household growth trajectories for the LCR. However, uncertainties remain over the likelihood and timing that the household headship rates for young adults might 'return' to pre-recession levels. Further analysis of age-specific headship rate evidence may be a consideration, preferably in conjunction with the additional 'household-type' projections which DCLG is due to release during summer 2015.

Appendix A

POPGROUP Methodology

Forecasting Methodology

- A.1 Evidence is often challenged on the basis of the appropriateness of the methodology that has been employed to develop growth forecasts. The use of a recognised forecasting product which incorporates an industry-standard methodology (a cohort component model) removes this obstacle and enables a focus on assumptions and output, rather than methods.
- A.2 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 8) is a cohort component model, which enables the development of population forecasts based on births, deaths and migration inputs and assumptions.
- A.3 The Derived Forecast (DF) model (Figure 9) sits alongside the population model, providing a headship rate model for household projections and an economic activity rate model for labour-force projections.
- A.4 The latest development in the POPGROUP suite of demographic models is POPGROUP v.4, which was released in January 2014. A number of changes have been made to the POPGROUP model to improve its operation and to ensure greater consistency with ONS forecasting methods. The most significant methodological change relates to the handling of internal migration in the POPGROUP forecasting model. The level of internal in-migration to an area is now calculated as a rate of migration relative to a defined 'reference population' (by default the UK population), rather than as a rate of migration relative to the population of the area itself (as in POPGROUP v3.1). This approach ensures a closer alignment with the 'multi-regional' approach to modelling migration that is used by ONS.
- A.5 For further information on POPGROUP, please refer to the Edge Analytics website:
<http://edgeanalytics.co.uk/popgroup>.

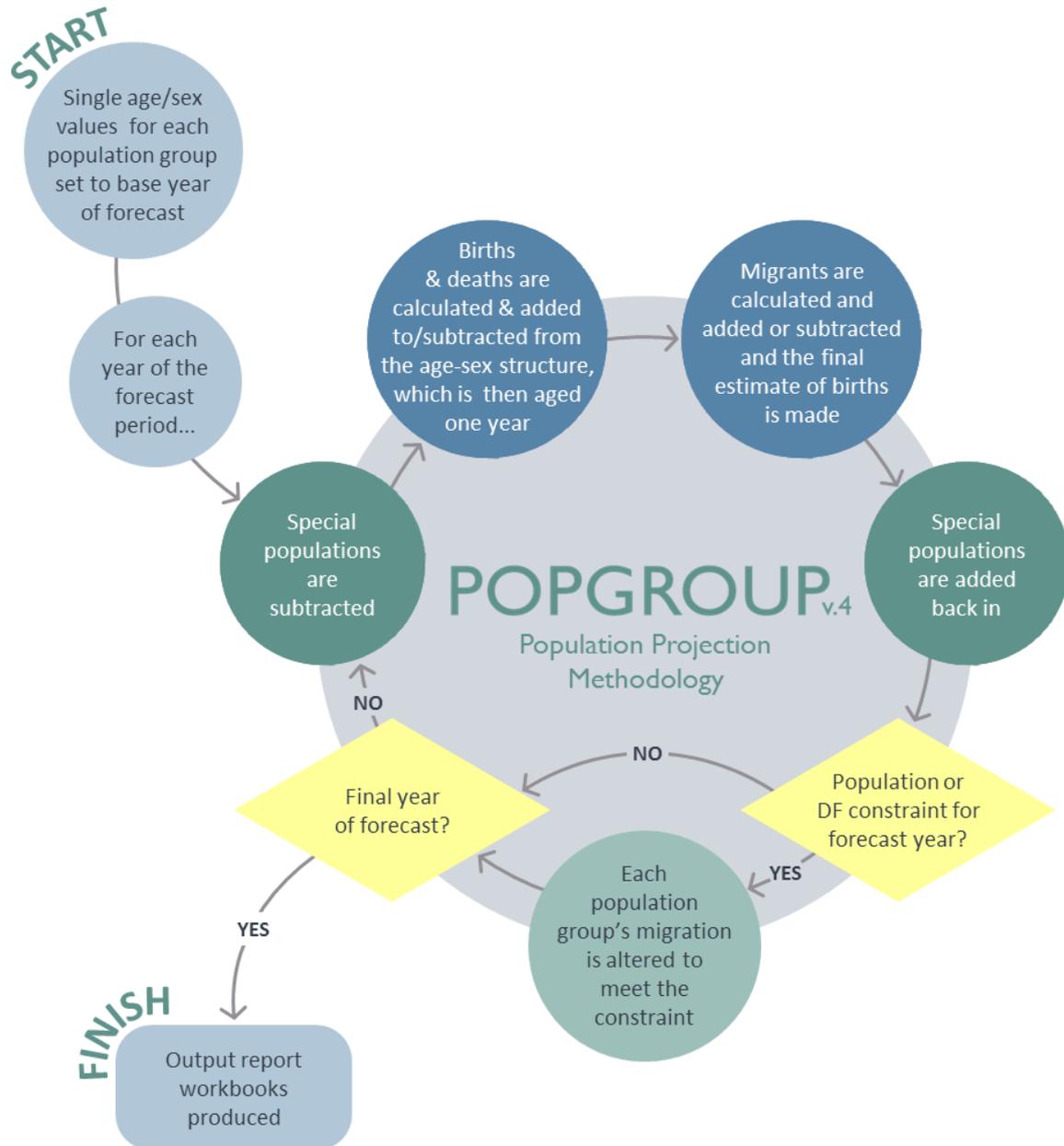
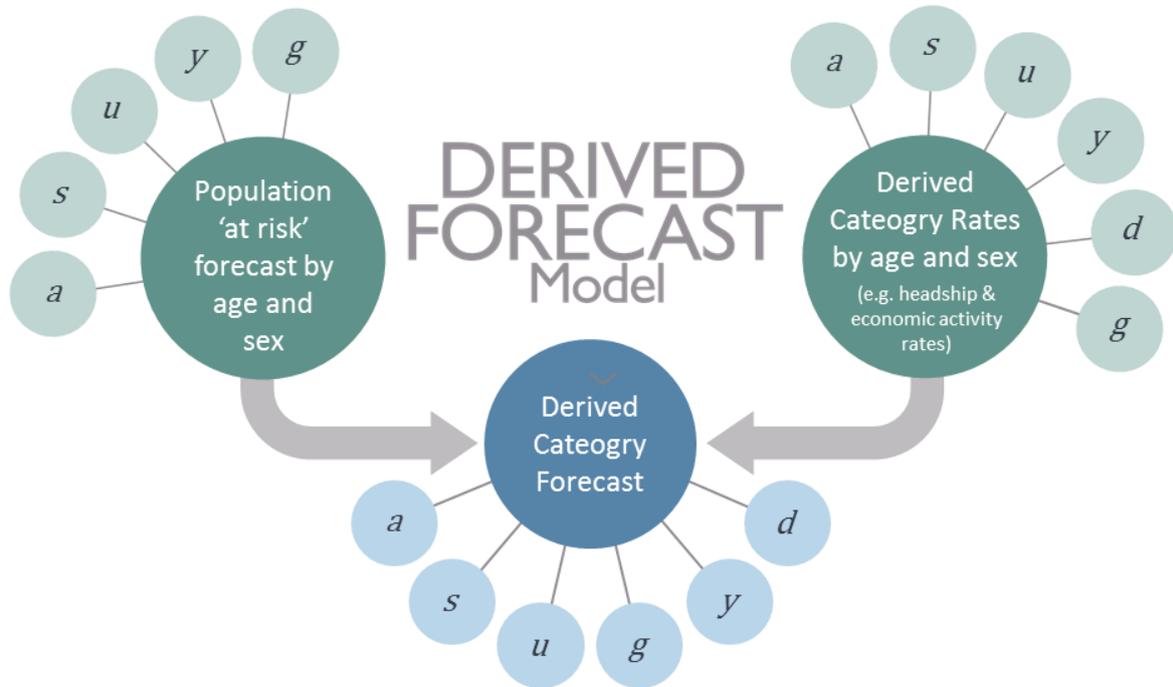


Figure 8: POPGROUP population projection methodology



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

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

Figure 9: Derived Forecast (DF) methodology

Appendix B

Data Inputs & Assumptions

Introduction

- B.1** Edge Analytics has developed a suite of demographic scenarios for the LCR using POPGROUP v.4 and the Derived Forecast model. The POPGROUP suite of demographic models draw data from a number of sources, building an historical picture of population, households, fertility, mortality and migration on which to base its scenario forecasts.
- B.2** Using historical data evidence for 2001–2013, in conjunction with information from ONS sub-national population projections (SNPPs) and DCLG household projections, a series of assumptions have been derived which drive the scenario forecasts.
- B.3** The following scenarios have been produced:
- **SNPP-2010 & SNPP-2012**
 - **Natural Change**
 - **PG-5yr & PG-5yr-X**
 - **PG-10yr & PG-10yr-X**
 - **Jobs-led REM Dec 2013 & Jobs-led REM Dec 2013 SENS1**
 - **Jobs-led REM Dec 2014 & Jobs-led REM Dec 2014 SENS1**
- B.4** In the following sections, a narrative on the data inputs and assumptions underpinning the scenarios is presented.

Population, Births & Deaths

Population

- B.5** In each scenario, historical population statistics are provided by the mid-year population estimates (MYEs) for 2001–2013, with all data recorded by single-year of age and sex. These data include the revised MYEs for 2002–2010, which were released by the ONS in May 2013. The revised MYEs 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.
- B.6** In the **SNPP-2010** scenario, future population counts are provided by single-year of age and sex to ensure consistency with the trajectory of the ONS 2010-based SNPP. The SNPP-2010 scenario is scaled to ensure consistency with the start point of the 2012-based SNPP, following its designated growth trend thereafter. This does not alter the underlying assumptions or growth trajectory.
- B.7** In the **SNPP-2012** scenario, future population counts are provided by single-year of age and sex to ensure consistency with the trajectory of the ONS 2012-based SNPP.

Births & Fertility

- B.8** In each scenario, historical mid-year to mid-year counts of births by sex from 2001/02—2012/13 have been sourced from ONS Vital Statistics.
- B.9** In the **SNPP-2010** and **SNPP-2012** scenarios, future counts of births are specified to ensure consistency with the official projections.
- B.10** In the other scenarios, a ‘local’ (i.e. area-specific) age-specific fertility rate (ASFR) schedule, which measures the expected fertility rates by age in 2013/14, is included in the POPGROUP model assumptions. This is derived from the ONS 2012-based SNPP.
- B.11** Long-term assumptions on changes in age-specific fertility rates are taken from the ONS 2012-based SNPP.

- B.12** In combination with the ‘population-at-risk’ (i.e. all women between the ages of 15–49), the area-specific ASFR and future fertility rate assumptions provide the basis for the calculation of births in each year of the forecast period.

Deaths & Mortality

- B.13** In each scenario, historical mid-year to mid-year counts of deaths by age and sex from 2001/02—2012/13 have been sourced from ONS Vital Statistics.
- B.14** In the **SNPP-2010** and **SNPP-2012** scenarios, future counts of deaths are specified to ensure consistency with the official projections.
- B.15** In the other scenarios, a ‘local’ (i.e. area-specific) age-specific mortality rate (ASMR) schedule, which measures the expected mortality rates by age and sex in 2013/14 is included in the POPGROUP model assumptions. This is derived from the ONS 2012-based SNPP.
- B.16** Long-term assumptions on changes in age-specific mortality rates are taken from the ONS 2012-based SNPP.
- B.17** In combination with the ‘population-at-risk’ (i.e. the total population), the area-specific ASMR and future mortality rate assumptions provide the basis for the calculation of deaths in each year of the forecast period.

Migration

Internal Migration

- B.18** In all scenarios, historical mid-year to mid-year estimates of in- and out-migration by five year age group and sex from 2001/02—2012/13 have been sourced from the ‘components of population change’ files that underpin the ONS MYEs. These internal migration flows are estimated using data from the Patient Register (PR), the National Health Service Central Register (NHSCR) and Higher Education Statistics Agency (HESA).
- B.19** In the **SNPP-2010** and **SNPP-2012** scenarios, future counts of internal migrants are specified, to ensure consistency with the official projections.

- B.20** In the **Natural Change** scenario, internal in- and out-migration flows are set to zero for each year in the forecast period (i.e. no in- or out-migration occurs).
- B.21** In the alternative trend scenarios, future internal migration flows are based on the area-specific historical migration data. In the **PG-5yr** and **PG-5yr-X** scenarios, a five year internal migration history is used (2008/09—2012/13). In the **PG-10yr** and **PG-10yr-X** scenarios, a ten year history is used (2003/04—2012/13).
- B.22** In the alternative trend scenarios (i.e. **PG-5yr**, **PG-5yr-X**, **PG-10yr** and **PG-10yr-X**), the relevant historical time period is used to derive the age-specific migration rate (ASMigR) schedules, which are then used to determine the future number of in- and out-migrants. In the case of internal in-migration, the ASMigR schedules are applied to an external 'reference' population (i.e. the population 'at-risk' of migrating into the area). This is different to the other components (i.e. births, deaths, internal out-migration), where the schedule of rates is applied to the area-specific population (i.e. the population 'at-risk' of migrating out of the area). The reference population is defined by considering the areas which have historically contributed the majority of migrants into the area. In the case of the LCR, it comprises all districts which cumulatively contributed 70% of migrants into the LCR over the 2008/09–2012/13 period.
- B.23** The **Jobs-led** scenarios calculate their own internal migration assumptions to ensure an appropriate balance between the population and the targeted increase in the number of jobs that is defined in each year of the forecast period. A higher level of net internal migration will occur if there is insufficient population and resident labour force to meet the forecast number of jobs, or if there is insufficient population to meet the forecast number of dwellings. In the **Jobs-led** scenarios, the profile of internal migrants is defined by an ASMigR schedule, derived from the ONS 2012-based SNPP.

International Migration

- B.24** Historical mid-year to mid-year counts of immigration and emigration by 5-year age group and sex from 2001/02—2012/13 have been sourced from the 'components of population change' files that underpin the ONS MYEs. Any 'adjustments' made to the MYEs to account for asylum cases are included in the international migration balance.
- B.25** Implied within the international migration component of change in all scenarios is an 'unattributable population change' (UPC) figure, which ONS identified within its latest mid-year

estimate revisions. The POPGROUP model has assigned the UPC to international migration as it is the component with the greatest uncertainty associated with its estimation. In the 'X' scenarios, the UPC adjustment is not included in the international migration assumptions.

- B.26** In all scenarios, future international migration assumptions are defined as 'counts' of migration. In the **SNPP-2010** and **SNPP-2012** scenarios, the international in- and out-migration counts are drawn directly from the relevant official projection.
- B.27** In the **Natural Change** scenario, the future migration counts set the in- and out-migration flows to zero for each year in the forecast period (i.e. no in- or out-migration occurs).
- B.28** In the alternative trend scenarios, the international in- and out-migration counts are derived from the area-specific historical migration data. In the **PG-5yr** and **PG-5yr-X** scenarios, a five year international migration history is used (2008/09—2012/13). In the **PG-10yr** and **PG-10yr-X** scenarios, a ten year history is used (2003/04—2012/13).
- B.29** In all scenarios, an ASMigR schedule of rates is derived from either a five year or ten year migration history and is used to distribute future counts by single year of age.
- B.30** In the **Jobs-led** scenarios, international migration counts are taken from the ONS 2012-based SNPP (i.e. counts are consistent with the **SNPP-2012** scenario). An ASMigR schedule of rates from the ONS 2012-based SNPP is used to distribute future counts by single year of age.

Households & Dwellings

- B.31** The 2011 Census defines a household as:

“one person living alone, or a group of people (not necessarily related) living at the same address who share cooking facilities and share a living room or sitting room or dining area.”

- B.32** A dwelling is defined as a unit of accommodation which may comprise one or more household spaces (a household space is the accommodation used or available for use by an individual household).

B.33 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 the DCLG.

Household Headship Rates

B.34 A household headship rate (also known as household representative rate) is the *“probability of anyone in a particular demographic group being classified as being a household representative”*⁷.

B.35 The household headship rates used in the POPGROUP modelling have been taken from the DCLG 2008-based, 2011-based and 2012-based household projections. The DCLG household projections are derived through the application of projected household representative rates (also referred to as headship rates) to a projection of the private household population.

B.36 In the scenarios presented here, headship rate assumptions have been sourced from the new 2012-based household projection model, and from the earlier 2011-based and 2008-based models, producing three alternative outcomes for each scenario:

- In the **HH-12** outcome, the 2012-based DCLG headship rates are applied.
- In the **HH-11** outcome, the 2011-based headship rates are applied
- In the **HH-08** outcome, the 2008-based DCLG headship rates are applied, scaled to be consistent with the 2011 DCLG household total, but following the original trend thereafter.

2012-based Headship Rates

B.37 The 2012-based headship rates have been sourced from the new 2012-based household projection model from DCLG. The methodology used by DCLG in its household projection models consists of two distinct stages:

- **Stage One** produces the national and local authority projections for the total number of households by sex, age-group and relationship-status group over the projection

⁷ Household Projections 2012-based: Methodological Report. Department for Communities and Local Government (February 2015). <https://www.gov.uk/government/statistics/2012-based-household-projections-methodology>

period. All Stage One output and assumptions for the 2012-based household projection model has been released by DCLG.

- **Stage Two** provides the detailed ‘household-type’ projection by age-group, controlled to the previous Stage One totals. Stage Two assumptions and output for the 2012-based model have yet to be released by DCLG.

B.38 In POPGROUP, the 2012-based headship rates are defined by age, sex and relationship status. These rates therefore determine the likelihood of person of a particular age-group, sex and relationship status being head of a household in a particular year, given the age-sex structure of the population.

2008-based & 2011-based Headship Rates

B.39 The 2011-based and 2008-based headship rates are provided by age-group and household type and therefore define the likelihood of a particular household type being formed in a particular year, given the age-sex profile of the population. Household-types are modelled with a 17-fold classification (Table 6).

B.40 The 2008-based headship rates are scaled to the 2011 DCLG household total from the 2012-based household projection model, following the original trend thereafter.

Communal Population Statistics

B.41 Household projections in POPGROUP exclude the population ‘not-in-households’ (i.e. the communal/institutional population). These data are drawn from the DCLG 2012-based household projections, which use statistics from the 2011 Census. Examples of communal establishments include prisons, residential care homes and student halls of residence.

B.42 For ages 0–74, the number of people in each age group ‘not-in-households’ is kept fixed throughout the forecast period. For ages 75–85+, the proportion of the population ‘not-in-households’ is recorded. Therefore, the population not-in-households for ages 75–85+ varies across the forecast period depending on the size of the population.

Table 6: Household type classification

ONS Code	DF Label	Household Type
OPM	OPMAL	One person households: Male
OPF	OPFEM	One person households: Female
OCZZP	FAMC0	One family and no others: Couple: No dependent children
OC1P	FAMC1	One family and no others: Couple: 1 dependent child
OC2P	FAMC2	One family and no others: Couple: 2 dependent children
OC3P	FAMC3	One family and no others: Couple: 3+ dependent children
OL1P	FAML1	One family and no others: Lone parent: 1 dependent child
OL2P	FAML2	One family and no others: Lone parent: 2 dependent children
OL3P	FAML3	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

Vacancy Rate

- B.43** The relationship between households and dwellings is modelled using a 'vacancy rate', sourced from the 2011 Census. The vacancy rate is calculated using statistics on households (occupied, second homes and vacant) and dwellings (shared and unshared).
- B.44** For the LCR districts, vacancy rates of between 3.4% (Leeds and York) and 9.0 (Craven) have been applied, fixed throughout the forecast period. Using these vacancy rates, the 'dwelling requirement' of each household growth trajectory has been evaluated.

Table 7: Leeds City Region, vacancy rates

Source: 2011 Census

District	Vacancy Rate
Barnsley	4.0%
Bradford	3.8%
Calderdale	3.9%
Craven	9.0%
Harrogate	4.6%
Kirklees	4.2%
Leeds	3.4%
Selby	4.8%
Wakefield	4.1%
York	3.4%

Labour Force & Jobs

- B.45 The relationship between jobs growth and population growth is evaluated through the application of three key assumptions: economic activity rates, an unemployment rate and a commuting ratio.

Economic Activity Rates

- B.46 Economic activity rates determine the level of participation in the labour force, within specified age-bands.
- B.47 In the core scenarios the 2011 Census economic activity rates for each LCR district, by sex and five year age-group (ages 16-74), have been applied in 2011, with uplifts applied (to 2020) to account for State Pension Age (SPA) changes.
- B.48 In the sensitivity scenarios (**SENS1**), the 2011 Census economic activity rates (by sex, for the aggregate 16-74 age-group) have been applied and maintained throughout the forecast period.

Table 8: Leeds City Region, economic activity rates

Source: 2011 Census

Area	Economic Activity Rate		
	2011	2031	
	Core/SENS1	Core	SENS1
Barnsley	66%	64%	66%
Bradford	67%	65%	67%
Calderdale	70%	68%	70%
Craven	72%	69%	72%
Harrogate	74%	72%	74%
Kirklees	68%	67%	68%
Leeds	70%	69%	70%
Selby	74%	71%	74%
Wakefield	68%	67%	68%
York	70%	69%	70%

Unemployment Rate

- B.49** 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. The same unemployment rate profile is applied in the core and sensitivity scenarios.
- B.50** For each of the LCR districts, the latest (2014) unemployment rate is applied in 2014. The unemployment rate then incrementally decreases to the 'pre-recession' average (2004–2007) by 2020 (Table 9). These improvements in the unemployment rate provide an appropriate basis for what is likely to be a gradual recovery from current economic conditions.

Commuting Ratio

- B.51** The commuting ratio, together with the unemployment rate, controls 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. 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 less than 1.0 indicates that the number of jobs in the district exceeds the size of the labour force, resulting in a net in-commute.

B.52 From the 2011 Census Travel to Work statistics, published by ONS in July 2014, commuting ratios have been derived for the LCR districts. A comparison with the corresponding value from the 2001 Census is presented (Table 10). In all scenarios, the 2011 Census commuting ratio has been applied and remains constant throughout the forecast period.

Table 9: Leeds City Region, unemployment rates

Source: Annual Population Survey, NOMIS

Area	Unemployment Rate	
	2014	Average Pre-Recession (2004–2007)
Barnsley	7.7	5.3
Bradford	8.9	6.1
Calderdale	6.4	4.6
Craven	3.5	2.8
Harrogate	2.8	2.6
Kirklees	7.4	4.6
Leeds	8.4	5.4
Selby	4.8	3.7
Wakefield	6.9	4.7
York	4.6	3.6

Note: Unemployment rates are for January to December

Table 10: Leeds City Region, 2001 and 2011 Census commuting ratio comparison

Area	Commuting Ratio	
	2001 Census	2011 Census
Barnsley	1.19	1.25
Bradford	0.98	1.02
Calderdale	1.06	1.02
Craven	1.07	1.01
Harrogate	1.09	0.99
Kirklees	1.15	1.15
Leeds	0.85	0.87
Selby	1.22	1.22
Wakefield	1.05	1.00
York	0.94	0.96

Note: 2001 data from Census Table T101 – UK Travel Flows; 2011 data from Census Table WU02UK - Location of usual residence and place of work by age.