Sunderland

Updating the Demographic Evidence

October 2016

For the attention of:

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Acknowledgements

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Introduction

Context

1.1   Edge Analytics has provided a variety of demographic evidence to support Sunderland City Council's Local Plan preparation, with a Final Report submitted to Sunderland City Council in December 2015[1]. The demographic analysis presented a summary of historical change in Sunderland, together with a suite of population and household forecasts which considered official statistics, alternative trend scenarios and their relationship to independently-generated employment forecasts.

1.2   Since completion of the demographic analysis, there have been a number of new releases of official statistics from the Office for National Statistics (ONS) and the Department for Communities and Local Government (DCLG), including a 2015 mid-year population estimate (ONS), 2014-based sub-national population projection (ONS) and the 2014-based household projection (DCLG).

1.3   Sunderland City Council has requested an update to its demographic evidence which considers these new data releases, alongside an analysis of the latest economic growth forecasts. A plan period of 2015–2033 has been agreed, with all new demographic evidence required for this time-period.

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[1] Sunderland Demographic Analysis & Forecasts, December 2015

Approach

Official Guidelines

1.4   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)[2] and Planning Practice Guidance (PPG)[3] provide guidance on the appropriate approach to the objective assessment of housing need.

1.5   The PPG states that the DCLG household projections should provide the *"starting point estimate of overall housing need"* (PPG paragraph 2a-015). Local circumstances, alternative assumptions and the most recent demographic evidence, including ONS population estimates, should also be considered (PPG paragraph 2a-017). Evidence that links demographic change to forecasts of economic growth should also be assessed (PPG paragraph 2a-018).

1.6   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 information on POPGROUP, refer to Appendix A).

1.7   The choice of assumptions used within POPGROUP has an important bearing on scenario outcomes. This is particularly the case when trend-based projections are considered alongside population and household growth linked to jobs forecasts. 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.

Edge Analytics' Approach

1.8   Edge Analytics has used POPGROUP v.4 technology to update the demographic scenarios produced for the City of Sunderland in the December 2015 report. The 2014-based sub-national population projection (SNPP) is presented, together with an analysis of the 'components of change' underlying this new projection. These statistics are compared to previous estimates and to the historical data on births, deaths and migration. The most recent 2014-based DCLG

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[2]http://planningguidance.planningportal.gov.uk/blog/policy/
[3]http://planningguidance.planningportal.gov.uk/blog/guidance/

household projection model is also considered, with commentary provided on the differences between this and the earlier, 2008-based and 2012-based household projection model.

1.9   For comparison with the official population and household projections, alternative migration assumptions have been considered to derive variant growth scenarios for Sunderland, including a scenario which varies the extent of the net migration exchange with County Durham and scenarios which reduce overall net internal migration to zero.

1.10   Consideration of the alignment of housing growth with economic growth is a key requirement of the PPG. This analysis has evaluated the demographic implications of the most recent jobs growth forecast for Sunderland, developed by Experian, considering how key assumptions on future economic activity rates and commuting might influence dwelling growth outcomes.

1.11   All scenarios have been run with historical data for the 2001–2014 period, with the forecast period extending to 2033. Scenario results are presented for Sunderland City Council's 2015–2033 plan period.

Report Structure

1.12   **Section 2** presents a demographic profile of Sunderland including an historical perspective on population change since the 2001 Census and an illustration of migration and commuting patterns.

1.13   **Section 3** reviews the latest 2014-based data from the ONS and DCLG, with an analysis of the 'components of change' from the 2014-based SNPP and commentary on the 2014-based household projection model.

1.14   **Section 4** provides a summary of the demographic scenario outcomes, including sensitivities which examine variant household growth and alternative migration assumptions.

1.15   **Section 5** extends the scenario analysis, considering the link between demographic change and forecast jobs growth in Sunderland.

1.16   **Section 6** summarises the analysis and identifies a number of key issues for Sunderland City Council to consider in the formulation of its Local Plan evidence.

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1.17   **Appendix A and Appendix B** provide an overview of the POPGROUP methodology and further detail on the data inputs and assumptions used in the development of the scenarios.

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2 Sunderland Area Profile

Geography

2.1　The City of Sunderland is located within the North East of England, with the district of South Tyneside to the north, Gateshead to the north-west and County Durham to the west and south (Figure 1). Sunderland is predominantly urban. The A19 forms a key north-south route through the city and the A690 and A1231 provide an east-west link across the city between the A19 and A1(M). A rail route runs north-south along the coast.
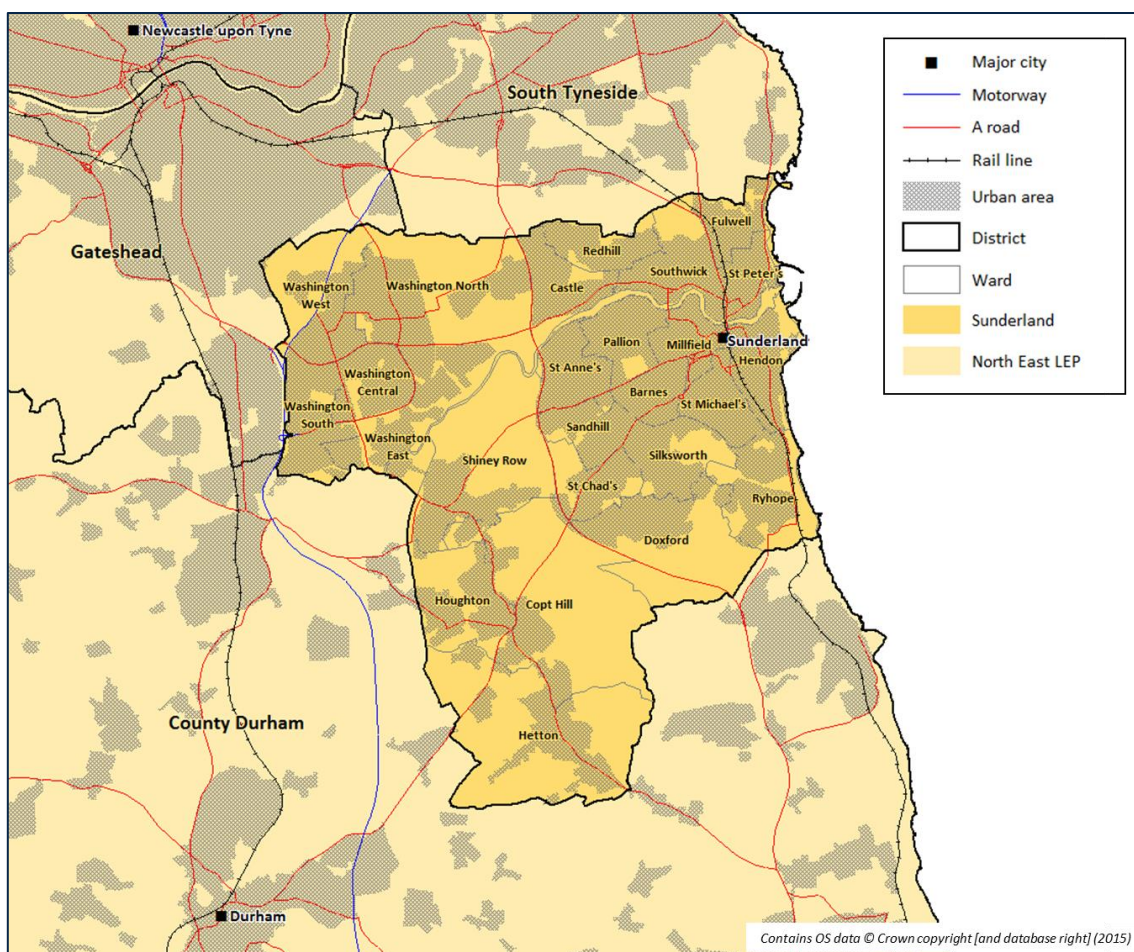
Figure 1: The City of Sunderland and its wider geographical context

Population Growth Profile

2.2   The latest 2015 mid-year estimate (MYE) for Sunderland has recorded a total population of 277,150. Population growth has been evident since 2011, when the population estimates for Sunderland were adjusted downwards to take account of new Census evidence (Figure 2).

2.3   Between successive Censuses, population estimation is necessary. These MYEs are derived by applying the 'components of change' (i.e. counts of births and deaths and estimates of internal and international migration) to the previous year's MYE. Following the 2011 Census, the 2002–2010 MYEs were 'rebased' to align them with the 2011 MYE and to ensure the correct transition of the age profile of the population over the 2001–2011 decade. At the 2011 Census, the resident population of Sunderland was 275,506, a -1.9% decline over the 2001–2011 decade. The 2011 Census population total proved to be *lower* than that suggested by the trajectory of growth from the previous MYEs. As a result, the revised final MYEs were *lower* than the previous MYEs.
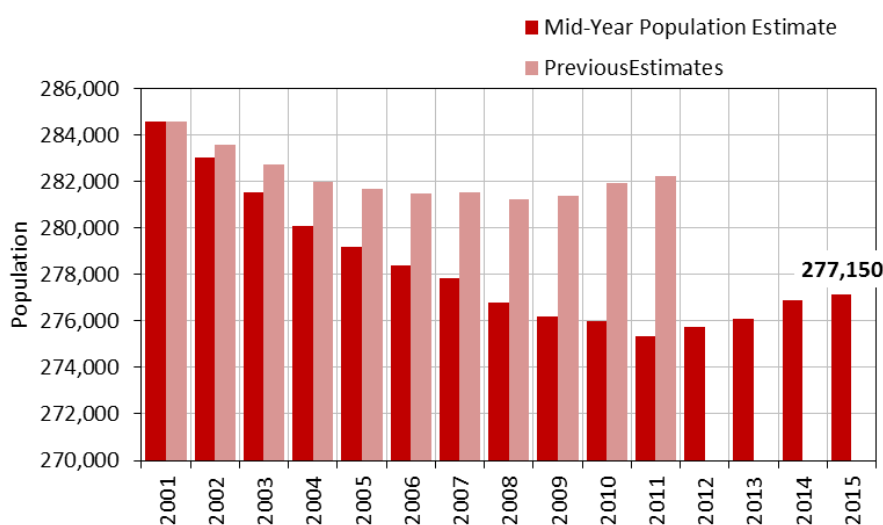
Figure 2: Sunderland mid-year population estimates, 2001–2015 (Source: ONS)

2.4   The rebasing of the MYEs involved the recalibration of the components of change for 2001/02 to 2010/11. 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

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2001 Census provided a robust population count, the 'error' in the MYEs is due to the challenges associated with the estimation of migration.

2.5 Internal migration (i.e. migration flows to and from other areas in the UK) is adequately measured using data from the Patient Register (PR), the National Health Service Central Register (NHSCR) and Higher Education Statistics Agency (HESA), 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 is associated with the mis-estimation of international migration, i.e. the balance between immigration and emigration flows to and from Sunderland.

2.6 However, the ONS did not explicitly assign the MYE adjustment to international migration. Instead it identified an additional 'unattributable population change' (UPC) component, suggesting it had not been able to accurately identify the source of the 2001–2011 over-count (Figure 3). The effect of the UPC adjustment depends upon the scale of population recalibration that has been required following the 2011 Census results. For Sunderland, the population estimates were subject to a consistent annual *decrease* due to the *over*-count over the 2001–2011 decade.
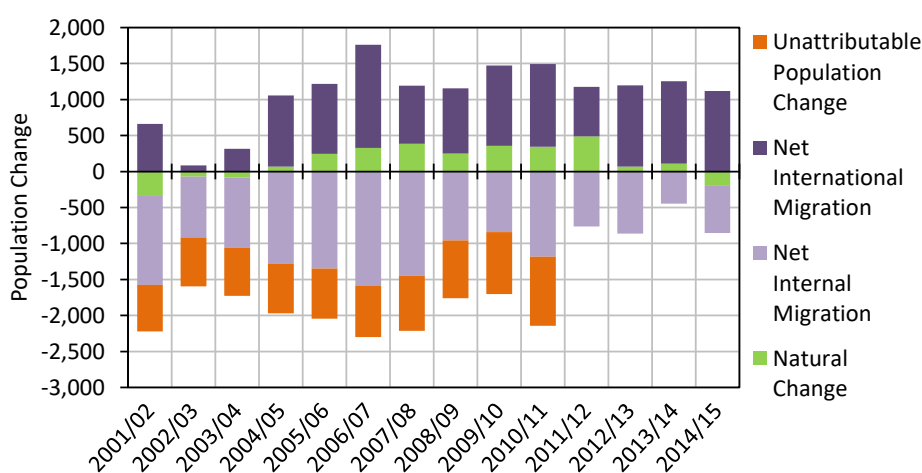
Figure 3: Sunderland components of change, 2001/02 to 2014/15 (Source: ONS)

2.7 Given the robustness of births, deaths and internal migration statistics compared to international migration estimates, it is assumed that UPC is most likely associated with the latter. 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 2012–2015 MYEs from the ONS, a fourteen-year profile of the 'components of change' is presented for Sunderland (Figure 4).

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Figure 4: Sunderland components of change, 2001/02 to 2014/15, including the UPC component in the 2001/02 to 2010/11 international migration component. (Source: ONS).

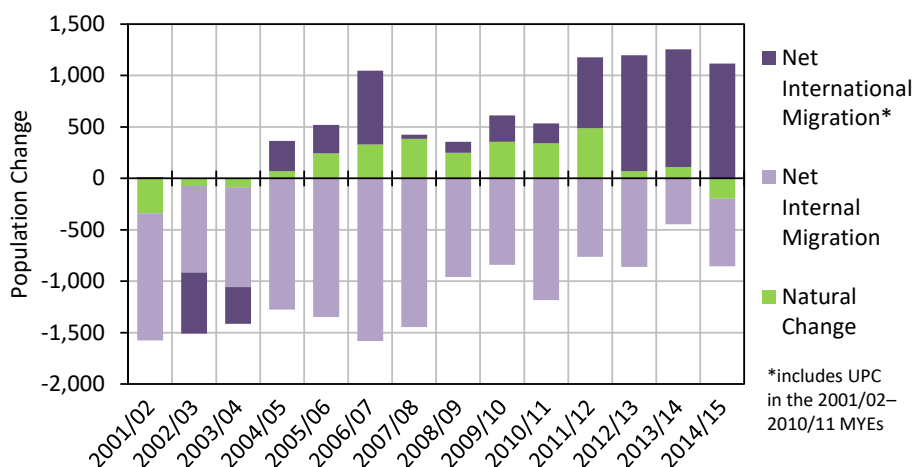2.8 Net out-migration to elsewhere in the UK has been a key component of Sunderland's population change over the 2001/02 to 2014/15 period, with the number of internal out-migrants exceeding the number of internal in-migrants. Since 2004/05, natural change has had a positive impact upon population change in Sunderland, with the number of births exceeding the number of deaths, although in the latest 2015 statistics, this has reverted to a net loss.

2.9 International migration has been the dominant driver of population growth since 2011, with estimated levels of net immigration that are similar to those applied between the 2001 and 2011 Census, prior to the UPC adjustment process.

Internal Migration & Age Profile

2.10 Internal migration records the more permanent migration linkages between Sunderland and surrounding areas. The largest positive average annual net exchange (higher inflow than outflow) has historically been with Redcar and Cleveland. In terms of a net outflow exchange, the largest concentration has been between Sunderland and neighbouring County Durham (Figure 5). All statistics are based upon an annual average for the 2001/02 to 2014/15 time-period

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Top Ten net Inflows
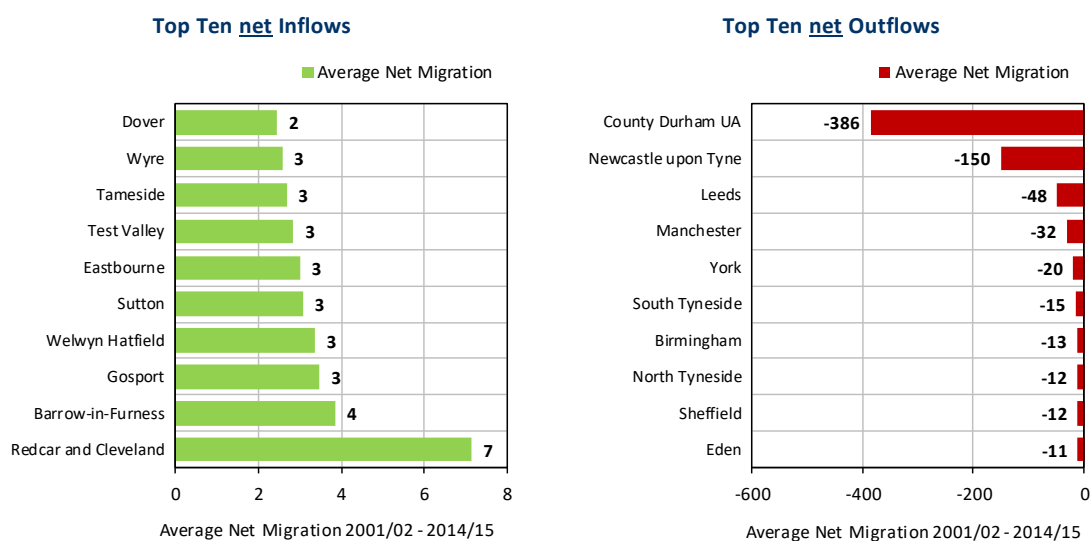

Top Ten net Outflows

Figure 5: Sunderland top-10 internal migration net inflows and outflows (source: ONS)

2.11   Using the 2014 base year of the latest ONS sub-national population projections, Sunderland's age profile is compared to that of Tyne & Wear and the North East of England (Figure 6).

Indicator	Sunderland	Tyne & Wear	North East	England
Aged 65+	18%	18%	19%	18%
Aged 80+	5%	5%	5%	5%
OAD ratio	28	27	29	27
Median age	42	40	42	40

OAD = Old Age Dependency Ratio
Population Aged 65+ / Population Aged 15-64
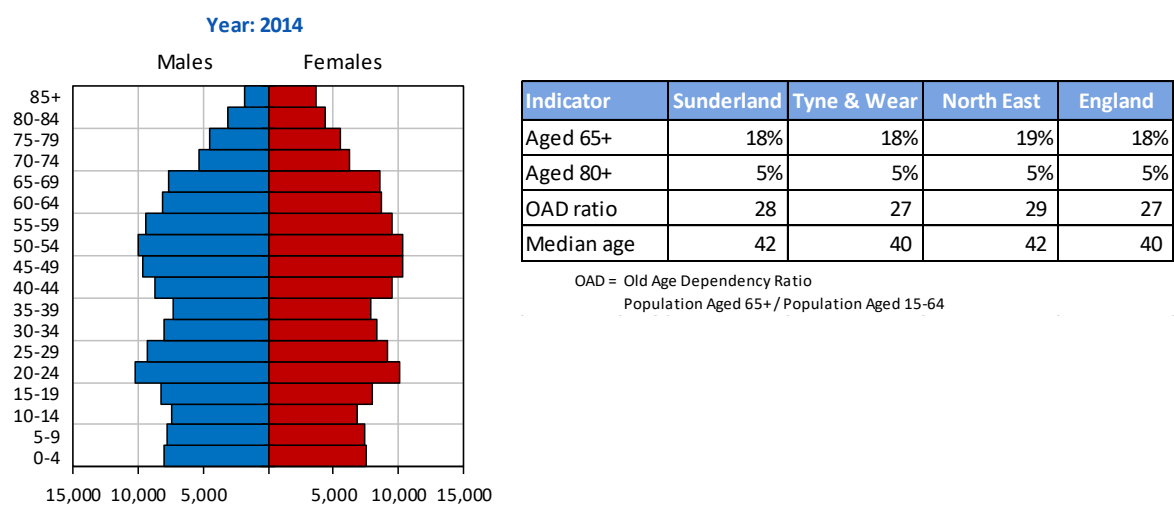
Figure 6: Sunderland, population age structure (source: ONS)

2.12   Sunderland's resident population comprises a smaller proportion of young adults (ages 15–39), compared to a more substantial proportion of older labour force age-groups (ages 40–74). The old age profile of Sunderland is similar to that of Tyne & Wear and the wider North East of England, with 18% of Sunderland's population aged 65+ and 5% of the population aged 80+. Sunderland's old age dependency (OAD) ratio and median age statistics are also comparable to those of the macro areas.

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2.13   The annual net impact of internal and international migration will alter the age profile of Sunderland's population. This will affect the composition of the resident labour force and the scale of Sunderland's housing requirement. Taking an average for 2001/02 to 2014/15, Sunderland has experienced net *internal* outflows in all age-groups, with the exception of the 15–19 age-group, which has seen a small net inflow (Figure 7). The most substantial net internal outflows have been experienced in the younger labour force age-groups (ages 20–39).
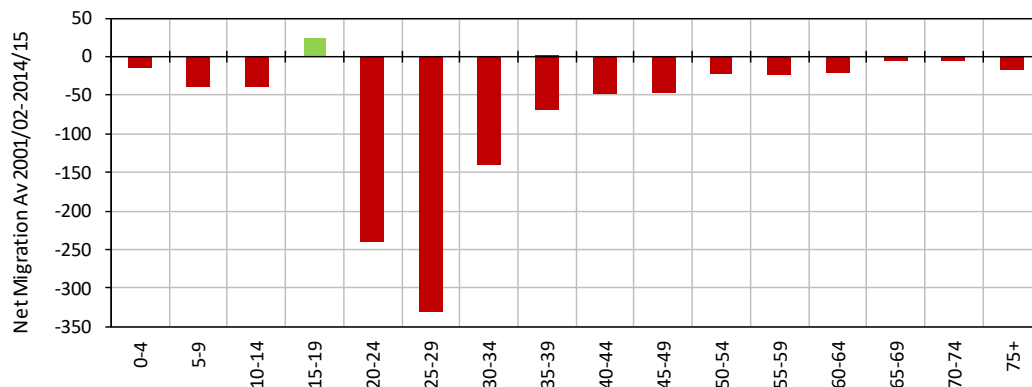
Figure 7: Sunderland, net internal migration flows by age-group, 2001/02 to 2014/15 (source: ONS)

International Migration

2.14   National Insurance Number (NINo) registrations provide an indication of the number of foreign nationals that have registered to work in Sunderland since 2001 (Figure 8).
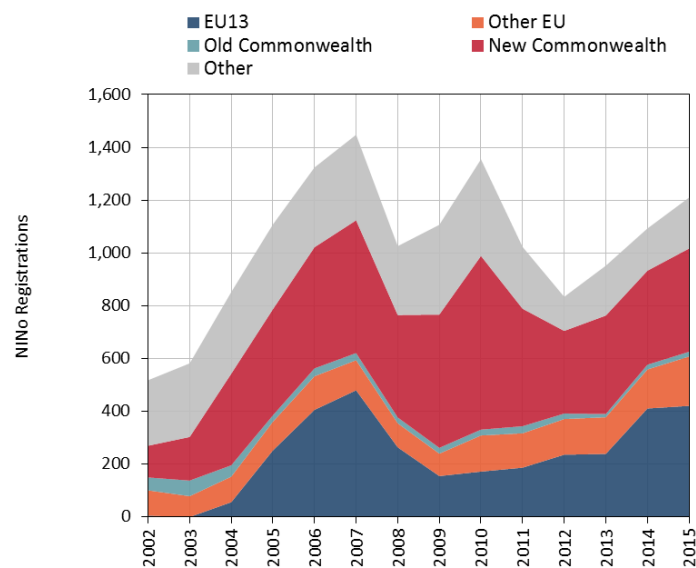
EU13 refers to countries that joined the European Union in 2004. Other EU refers to all other European Union countries.

Figure 8: NINo Registrations in Sunderland, 2002–2015 (source: DWP)

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2.15   Sunderland has historically received its largest proportion of NINo registrations from New Commonwealth countries, peaking in 2010. Since 2012, an increase in migrant registrations from Bulgaria and Romania has increased the EU share and resulted in an overall rise in the Sunderland NINo registration total.

2.16   These data do not align especially well with the ONS components of change as they are a record of immigration only (there is no associated de-registration statistics), they only include those registering for work (excluding dependents) and do not provide any evidence on the 'length-of-stay' of each migrant. However, they do provide a useful picture of the likely trend in immigration and an indication of the country-of-origin of migrants locating themselves in Sunderland.

Commuting Flows

2.17   In terms of travel-to-work commuting flows, the 2011 Census recorded 121,511 workers (ages 16–74) living in Sunderland (Table 1) and 126,157 workers (ages 16–74) travelling to jobs in Sunderland (Table 2).

2.18   The majority of workers who live in Sunderland (70.2%) have jobs within Sunderland. Most of the remaining resident workers travel to jobs in the neighbouring districts of County Durham (7.7%), Gateshead (5.9%) and Newcastle upon Tyne (5.1%), whilst the remaining 11.1% of resident workers travel to jobs elsewhere (Table 1).

2.19   The majority of jobs in Sunderland (67.7%) are taken by workers who live in Sunderland. Most of the remaining jobs are taken by workers who live in the neighbouring districts of County Durham (12.4%) and South Tyneside (6.9%), whilst the remaining 13.0% of jobs are taken by workers who live elsewhere (Table 2).

Table 1: Sunderland 2011 Census commuting flows: workers, ages 16–74 (source: ONS)

Where do people who live in Sunderland work?			
Live	**Work**	**Flow**	**%**
Sunderland	Sunderland	85,354	70.2%
Sunderland	County Durham	9,383	7.7%
Sunderland	Gateshead	7,127	5.9%
Sunderland	Newcastle upon Tyne	6,146	5.1%
Sunderland	Other	13,501	11.1%
Total Workers		**121,511**	**100.0%**

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Table 2: Sunderland 2011 Census commuting flows: jobs, ages 16–74 (source: ONS)

Where do people who <u>work</u> in Sunderland live?			
Live	**Work**	**Flow**	**%**
Sunderland	Sunderland	85,354	67.7%
County Durham	Sunderland	15,672	12.4%
South Tyneside	Sunderland	8,726	6.9%
Other	Sunderland	16,405	13.0%
	Total Jobs	**126,157**	**100.0%**

2.20   Data from successive censuses reveals that the number of workers living in Sunderland is exceeded by the number of jobs available, resulting in a net in-commute. This imbalance has increased slightly over the 2001–2011 decade, as the number of jobs available has increased at a faster rate than the number of resident workers (Table 3).

Table 3: Sunderland 2001 and 2011 travel-to-work commuting ratios, ages 16–74 (source: ONS)

Sunderland		2001 Census	2011 Census
Workers	a	114,095	121,511
Jobs	b	117,015	126,157
Commuting Ratio	a/b	**0.98**	**0.96**

3 Official Projections

3.1 In this section, the latest population and household projections from the ONS and the DCLG are considered. Together with Section 2, this section presents the context for the development of a range of alternative growth scenarios, detailed in Section 4.

Official Statistics

3.2 In the absence of a population register, the UK continues to rely on the ten-yearly Census for a definitive count of population within its constituent local authority areas. Between Censuses, MYEs are calculated, using data on births, deaths, internal and international migration to quantify annual growth (Figure 9).
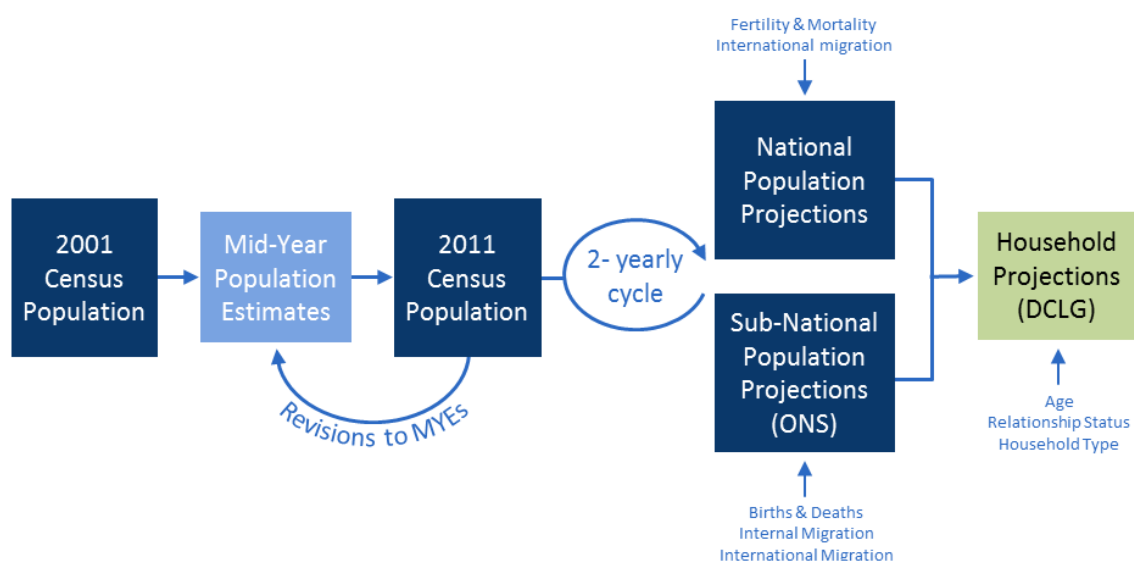
Figure 9: Official Statistics – population and households

3.3 Every two years, the Office for National Statistics (ONS) publishes its national population projections, setting key assumptions on the long-term effects of fertility, mortality and international migration to estimate population growth outcomes for England, Wales, Scotland and Northern Ireland. The 2014-based national projection was released in October 2015[4].

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[4] http://www.ons.gov.uk/ons/rel/npp/national-population-projections/2014-based-projections/index.html

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3.4   The national projection informs the sub-national population projections (SNPPs) for English local authorities, also published on a bi-yearly cycle. The latest 2014-based SNPPs use a combination of national and local assumptions on births, deaths and migration to formulate a 25-year projection for each local authority area.

3.5   The SNPPs provide the key demographic input to the DCLG household projections. The latest 2014-based household projection model provides a 25-year projection of household growth in each of the English local authorities.

3.6   The PPG states that the DCLG household projections should provide the "starting point estimate of overall housing need" (PPG paragraph 2a-015). The remainder of this section considers the 2014-based SNPP and the 2014-based DCLG household projection model for Sunderland, providing the context for complementary scenario analysis in Section 4.

ONS Sub-national Population Projection

3.7   In the development and analysis of population forecasts, it is important to benchmark any growth alternatives against the latest 'official' population projection. The most recent official subnational population projection is the ONS 2014-based SNPP, released in May 2016. These projections are based upon the 2014 MYE and use underlying demographic assumptions based on a 6-year historical period[5].

3.8   Figure 10 presents the most recent population projections for Sunderland. Under the latest, 2014-based SNPP, the population of Sunderland is expected to increase by +10,788 over the full 2014–2039 projection period, an increase of +3.9%. This is higher growth than projected under the previous 2012-based SNPP (1.7%) and is more in line with 2008-based and 2010-based projection outcomes, albeit from a lower base population

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[5]http://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationprojections/bulletins/subnationalpopulationprojectionsforengland/2014basedprojections

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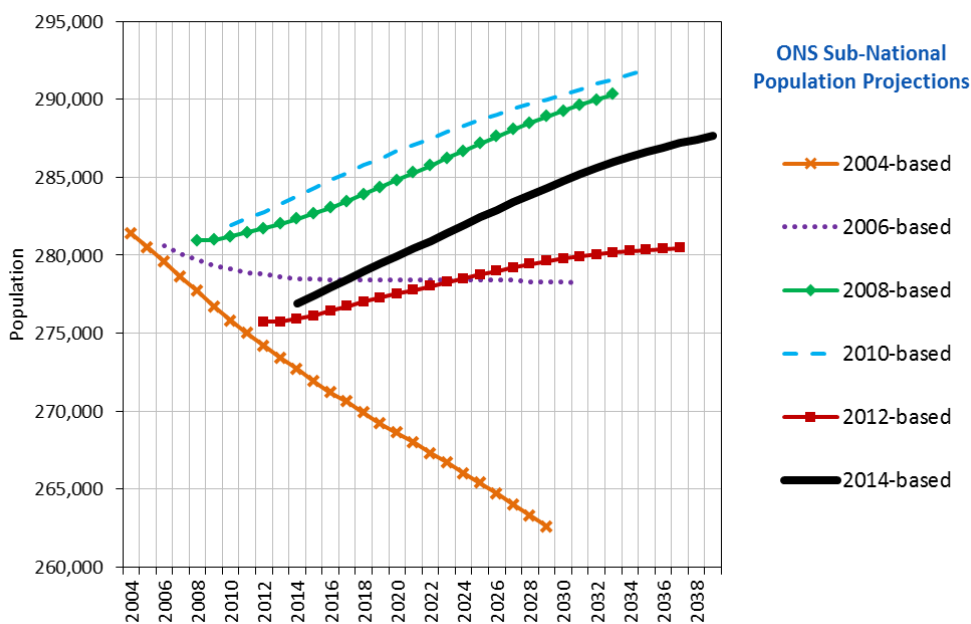
Figure 10: Sunderland official ONS population projections (source: ONS)

3.9   The 2014-based SNPP components of change are presented in Figure 11, with the historical components of change for 2001/02–2011/12 included for comparison. The average annual natural change, net migration (internal and international) and population change for the 2014-based SNPP are compared to historical 6-year and 13-year averages in Table 4.
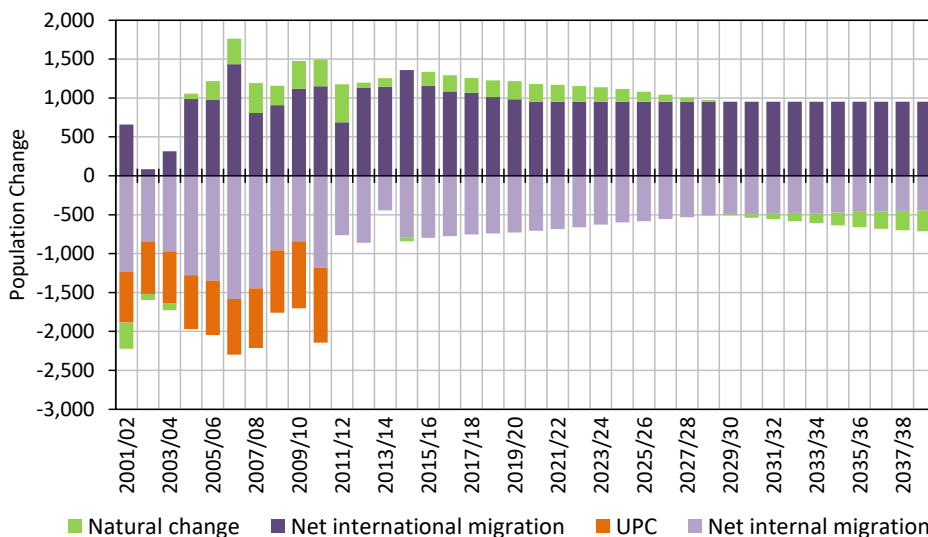
Figure 11: Sunderland historical and projected components of population change (source: ONS)

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Table 4: Sunderland 2014-based SNPP components of change (source: ONS)

Component of Change	Historical		Projected
	6-year average (2008/09–2013/14)	13-year average (2001/02–2013/14)	2014-based SNPP average (2014/15–2038/39)
Natural Change	269	165	32
Net Internal Migration	-842	-1,058	-590
Net International Migration	1,023	877	990
Total Net Migration	181	-182	400
UPC*	-874	-750	-

* UPC is only applicable to the years 2001/02 to 2010/11

3.10   Historically, over both the 6-year and 13-year periods, internal migration to and from Sunderland has contributed a net loss of population. In the 2014-based SNPP, the net balance of internal migration is expected to continue to be outward but at a much reduced level.

3.11   The impact of natural change has been positive since 2002 (i.e. the number of births exceeded the number of deaths). This is expected to continue in the first 15 years of the 2014-based SNPP, reverting to a net loss thereafter.

3.12   With regards to international migration, the 2014-based SNPP projects a continuing and substantial net growth over the 2014–2039 period, with net immigration the dominant driver of population growth in Sunderland. Any adjustments for UPC that may have been associated with international migration are excluded from the 2014-based SNPP international migration assumptions for Sunderland.

DCLG Household Projection

3.13   In the evaluation of housing need, the PPG states that the DCLG household projections "*should provide the starting point estimate of overall housing need*" (PPG paragraph 2a-015). The 2014-based household projection model, which is underpinned by the 2014-based SNPP, was released by the DCLG in July 2016, superseding the 2012-based household projection model.

3.14   The methodological basis of the new 2014-based model is consistent with that employed in the previous 2008-based and 2012-based household projections. A 'two-stage' methodology has been used by DCLG. 'Stage One' produces the national and local projections for the total number

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of households by age-group and relationship status group over the projection period. 'Stage Two' provides the detailed household type breakdown by age.

3.15   The 2014-based household headship rates (also referred to as household representative rates) have changed little from the 2012-based model, with only small adjustments made to account for new evidence arising from the latest Labour Force Survey (LFS) extracts. As a result, the latest 2014-based household projections differ from the 2012-based versions, primarily on the basis of a different underpinning population projection

3.16   The official 2014-based DCLG household projection model for Sunderland, underpinned by the 2014-based SNPP, suggests that the number of households will increase by 12,813 over the 2014–2039 projection period, equivalent to an additional 513 households per year. The average household size is projected to decrease from 2.25 in 2014 to 2.11 by 2037.

3.17   The rate of household growth under the 2014-based projection is higher than that implied by the 2012-based model (9.3% and 448 households per year) but lower than the 2008-based outcome (13.7% and 660 households per year) (Figure 12).

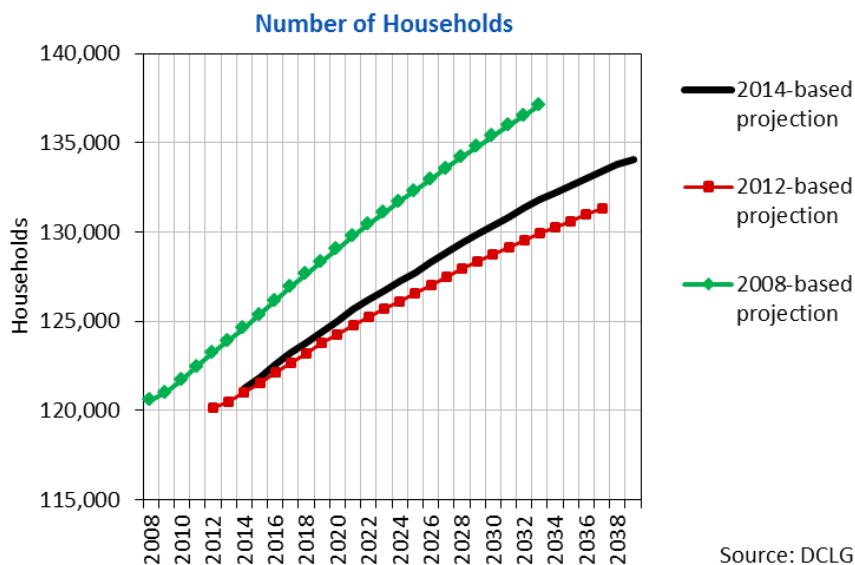
Figure 12: Sunderland household growth projections (source: DCLG)

3.18   The DCLG household projection, underpinned by the latest ONS population projection, provides the 'starting point' in the assessment of housing need (PPG paragraph 2a-015). Over the 2015–2033 plan period, the 2014-based household projection model suggests an increase of 9,963

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households, approximately 554 per year. Over the same time period, the 2014-based SNPP projects 3% growth in the population, equivalent to an additional 8,560 people (Table 5).

Table 5: Sunderland 'starting point' estimates (source: ONS and DCLG)

	Variable	2015	2033	Difference	*% Difference*	Average (per year)
2014-based SNPP	Population	277,406	285,966	8,560	*3%*	476
2014-based DCLG Model	Households	121,842	131,805	9,963	*8%*	554
	Household population	273,723	281,452	7,729	*3%*	429
	Average household size	2.25	2.14	-0.11	*-5%*	-0.01

3.19 As outlined in the PPG, it is appropriate to consider "*alternative assumptions in relation to the underlying demographic projections and household formation rates*" of the local area (PPG Paragraph 2a-017). Therefore, in the following sections, these 'official' projections are compared to a range of alternative demographic and economic scenarios.

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4 Demographic Scenarios

Introduction

4.1 This report provides an update on previous evidence and introduces the 2014-based population and household projections as the revised 'starting point' for the assessment of housing need. There is no single definitive view on the likely level of population and household growth expected in the City of Sunderland, with a combination of economic, demographic and national/local policy issues ultimately determining the speed and scale of change. For comparison with the 'starting point' evidence, a range of growth alternatives are presented here, replicating scenarios from the December 2015 report but updating with the latest 2014 demographic assumptions. Additional scenarios that reduce net internal migration to zero are also considered.

4.2 The 2014-based SNPP is presented as the official 'benchmark' scenario, with household growth assessed using headship rate assumptions from the 2008-based, 2012-based and 2014-based household projection models. For comparison with this official benchmark, a range of alternative 'trend' scenarios has been developed, in which variant migration assumptions have been applied.

4.3 The PPG states that the likely change in the number of jobs in an area should be considered, as should the size and structure of the labour force (PPG paragraph 2a-018). Therefore, the labour force and employment growth implications of these demographic scenarios have also been evaluated, through the application of economic activity rates, unemployment rates and a commuting ratio. These scenario outcomes are revisited in the context of anticipated jobs growth in Sunderland, as forecast by Experian.

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Scenario Definition

Official Projections

4.4   The **SNPP-2014** scenario replicates the ONS 2014-based SNPP. Through the application of the household growth assumptions from the 2014-based DCLG household projection model, the 'starting point estimate' for Sunderland is provided.

4.5   For comparison with the previous analysis an **SNPP-2012** scenario is included, replicating the ONS 2012-based population projection.

Alternative Trend Scenarios

4.6   The PPG recommends, as part of the assessment of housing need, that the most recent demographic statistics from the ONS and alternative demographic projections should be considered (PPG Paragraph 2a-017).

4.7   The ONS 2014-based SNPP is a trend-based projection that draws demographic assumptions from a 6-year historical period to 2014[6]. Given the unprecedented economic changes that have occurred since 2008, and the differences between the projected 2014-based SNPP data and the historical data (see Table 4), it is appropriate to consider alternative time periods in the derivation of migration assumptions.

4.8   The following trend scenarios have been developed:

- **PG-5yr**: internal migration rates and international migration flow assumptions are based on the last five years of historical evidence (20010/11 to 2014/15).

- **PG-10yr**: internal migration rates and international migration flow assumptions are based on the last 10 years of historical evidence (2005/06 to 2014/15).

4.9   Note that these scenarios include one additional year of historical data when compared to the 2014-based SNPP (i.e. the 2015 MYE). Furthermore, in both of these scenarios the UPC adjustment is *included* within the international migration assumptions.

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[6]http://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationprojections/bulletins/subnationalpopulationprojectionsforengland/2014basedprojections

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4.10 An additional **Natural Change** scenario models the effect of internal and international migration rates that are set to zero from 2014/15 onwards. This scenario provides an indication of the degree to which dwelling growth is driven solely by migration to/from Sunderland.

4.11 In consultation with Sunderland City Council, an additional **PG** sensitivity, **PG-10yr SENS CD Mig**, has been developed, which considers a 25% reduction in the annual net migration loss to County Durham, specifically. During the most recent 10-year historical period (2004/05 to 2014/15), the average annual net loss of population from Sunderland to County Durham has been approximately 386 per year (Table 6).

Table 6: Migration flows between Sunderland & County Durham (2005/06 to 2014/15) (source: ONS)

Internal Migration	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	10-year Average
Inflow *From County Durham to Sunderland*	1,070	1,230	1,310	1,450	1,270	1,390	1,725	1,559	1,670	1,686	1,436
Outflow *From Sunderland to County Durham*	1,740	1,960	1,960	1,710	1,720	1,830	1,854	1,826	1,834	1,789	1,822
Net flow *To Sunderland*	-670	-730	-650	-260	-450	-440	-129	-267	-164	-103	-386

4.12 In the **PG-10yr SENS CD Mig** sensitivity the net loss of population from Sunderland to County Durham is reduced by 25% in each year of the forecast period:

- **PG-10yr SENS CD Mig**: internal migration rates and international migration flow assumptions are based on the last 10 years of historical evidence (2005/06 to 2014/15), with net internal out-migration reduced by 97 in each year of the forecast period.

4.13 Two final trend scenarios examine the effects of a more 'balanced' internal migration profile upon Sunderland's SNPP-2014 growth outcome:

- **SNPP-2014 SENS Zero Mig**: the inflow and outflow of internal migrants results in a net migration balance of zero, for all years of the forecast period.
- **SNPP-2014 SENS Reducing Mig**: this scenario also seeks to achieve zero net internal migration but does so through a gradual change in the net balance over the course of the forecast period.

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Demographic Scenario Results

4.14 Each of the demographic scenarios (and sensitivities) has been run using historical MYEs for the 2001–2015 period. Results are presented in Figure 13 and Table 7 for the 2015–2033 plan period.

4.15 Under the benchmark **SNPP-2014** scenario, the population of Sunderland increases by +8,560 over the 2015–2033 plan period, equivalent to +3.1% growth. The number of households increases by +9,965, equivalent to +8.2% growth, resulting in an average annual dwelling requirement of +570 per year.

4.16 Of the **PG-5yr**, **PG-10yr** and **Natural Change** scenarios, population growth (over the 2015–2033 plan period) is highest under the **PG-5yr** scenario, at +2.7% and lowest under the **Natural Change** scenario, at -0.3%.

4.17 The **Natural Change** scenario indicates a dwelling requirement of +509 per year, in the absence of migration and driven solely by changes in the population due to births, deaths and ageing.

4.18 The alternative **PG-10yr** trend scenario suggests lower population and household growth than the **PG-5yr** scenario, resulting in a lower average annual dwelling requirement: +448 (**PG-10yr**), compared to +534 (**PG-5yr**). This is a reflection of *lower* levels of net international in-migration and *higher* levels of net internal out-migration that occurred in Sunderland over the extended 10-year historical period (Figure 4).

4.19 Adjustments to the migration flow between Sunderland and County Durham has a relatively limited impact upon population growth. With a reduced net internal migration outflow to County Durham, population growth is higher under the **PG-10yr SENS CD Mig** sensitivity (+1.3%), compared to the **PG-10yr** scenario (+0.6%).

4.20 A more significant variation in the population growth outcome for Sunderland is evident when a zero net internal migration balance is achieved. Under the **SNPP-2014 SENS Reducing Mig** scenario, net internal migration gradually reduces to zero by the end of the plan period. This results in a 5.2% growth in the population, with an associated annual dwelling requirement of 742 per year. With a more immediate zero net migration balance, the **SNPP-2014 SENS Zero Mig** scenario results in 7.8% growth to 2033 and a +947 average annual dwelling requirement.

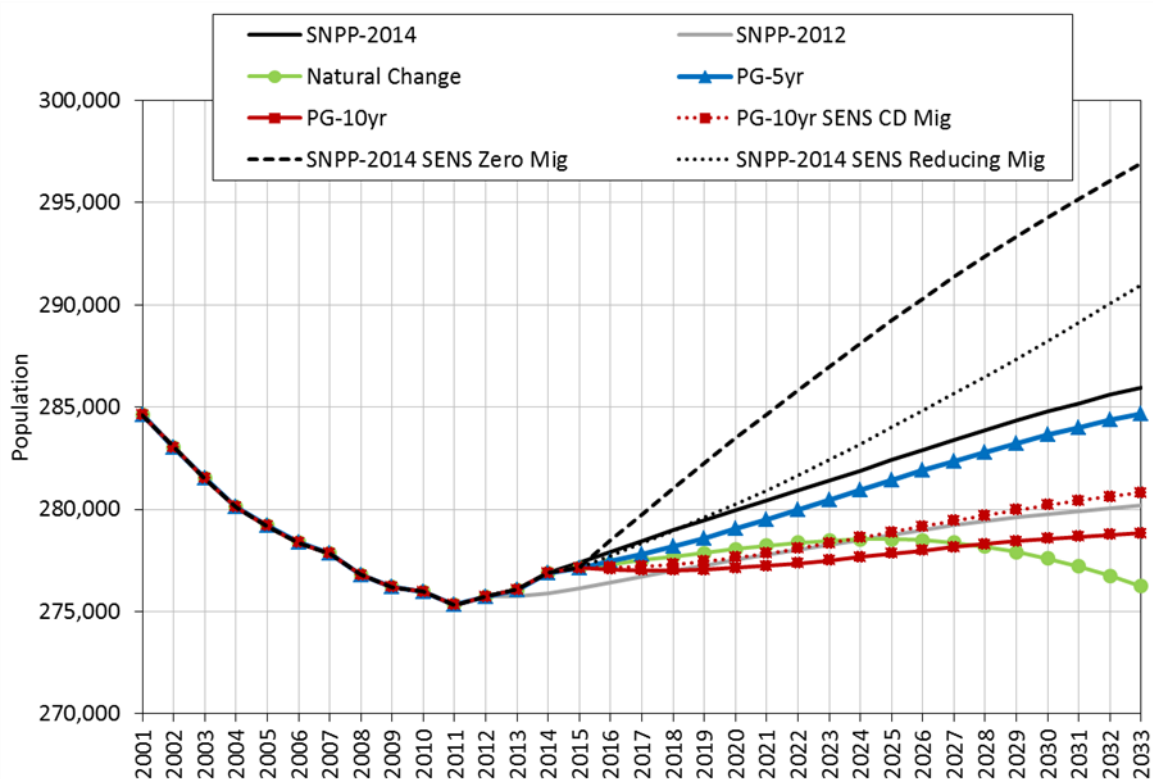edge analytics

Sunderland Demographic Scenarios

Figure 13: Sunderland demographic scenario outcomes: population growth 2001–2033

Table 7: Sunderland demographic scenario outcomes 2015–2033

Scenario	Change 2015 - 2033				Average per year	
	Population Change	Population Change %	Households Change	Households Change %	Net Migration	Dwellings
SNPP-2014 SENS Zero Mig	21,594	7.8%	16,540	13.6%	982	947
SNPP-2014 SENS Reducing Mig	14,354	5.2%	12,958	10.6%	652	742
SNPP-2014	8,560	3.1%	9,965	8.2%	360	570
PG-5yr	7,544	2.7%	9,325	7.7%	318	534
SNPP-2012	4,043	1.5%	8,454	7.0%	72	484
PG-10yr SENS CD Mig	3,674	1.3%	8,631	7.1%	147	494
PG-10yr	1,675	0.6%	7,829	6.4%	51	448
Natural Change	-898	-0.3%	8,887	7.3%	0	509

Note that household growth has been assessed using the 2014-based headship rates and the dwelling growth figures using a fixed 2.9% vacancy rate.

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Headship Rate Sensitivity

4.21 In the scenarios presented above, the DCLG 2014-based headship rates have been applied, in line with the PPG recommendation to use the latest available household projection assumptions. However, as stated in the PPG, it is appropriate to consider *"alternative assumptions in relation to the underlying demographic projections and household formation rates"* of the local area (PPG Paragraph 2a-017).

4.22 For comparison, each scenario has therefore been run using the headship rates from the earlier 2008-based (**HH-08**) and 2012-based (**HH-12**) DCLG household projection models. In addition, adjustments have been made to the 2014-based headship rates to model a 'return' to previous (2001) headship rates for young adults aged 25–34. This sensitivity evaluates how a return to previous household growth rates could manifest itself in higher household growth outcomes. The evidence for the application of the **HH-14 Return** headship rates is in the assumptions detail of DCLG's 2014-based household model (Figure 14).

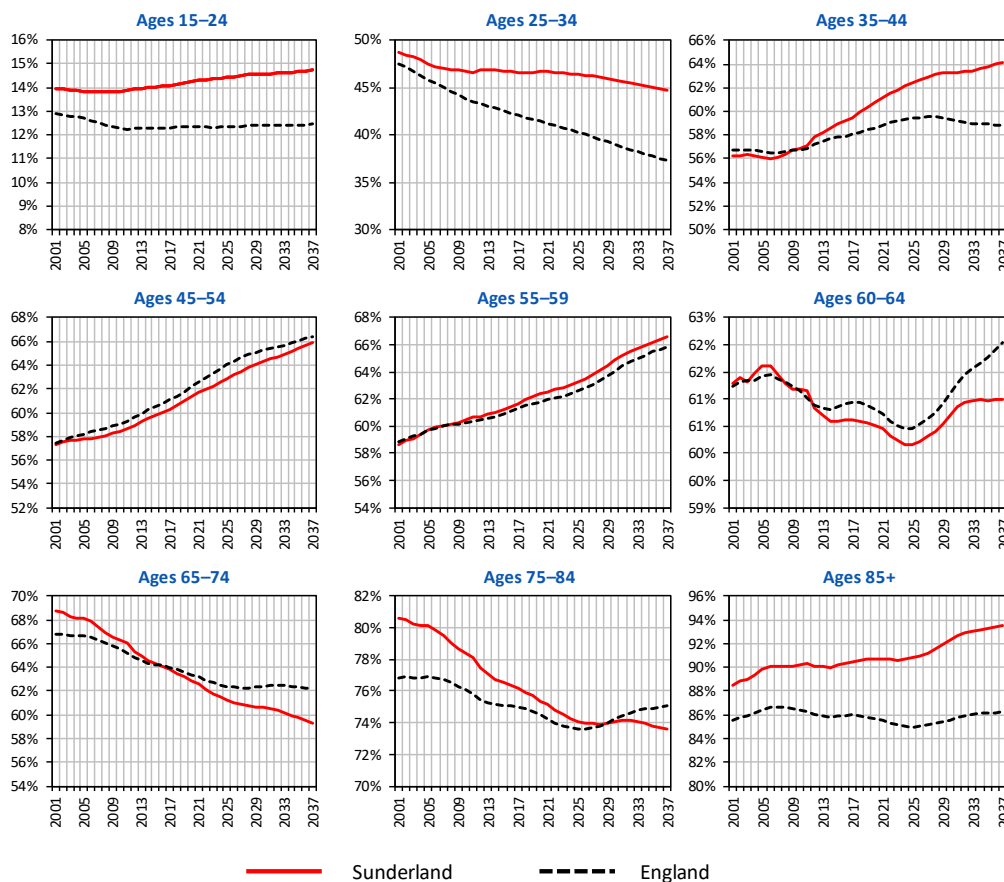**Sunderland and England: DCLG 2014-based Headship Rates**

Figure 14: Sunderland and England headship rates, 2014-based model (Source: DCLG)

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4.23 In the case of Sunderland, the 2014-based headship rates for the 25–34 age-group are estimated to *decline* over the projection period, whilst the rates for the other younger adult age groups (i.e. 15–24 and 35–44) *increase* over time (Figure 14). Therefore, the **HH-14 Return** headship rates consider a return of only the 25–34 age-group to its 2001 level by 2024, following the original trend thereafter.

4.24 Each of the headship rate alternatives result in a higher level of household growth and higher average annual dwelling requirements than the benchmark 2014-based rates (**HH-14**) (Table 8).

4.25 Dwelling growth outcomes from the 2012-based and 2014-based scenarios are very similar, reflecting the fact that only very minor changes have been made to household headship rate assumptions in the 2014-based model.

4.26 The application of the 2008-based headship rates generally suggests higher household growth (on average 8% higher than the **HH-14** outcomes), reflective of the different market conditions during the period from which the household model assumptions have been calibrated.

4.27 With the headship rates of the younger 25–34 age group adjusted, the **HH-14 Return** rates result in a level of household growth that approaches the **HH-08** outcomes (on average 6% higher than the **HH-14** outcomes).

Table 8: Sunderland demographic scenario dwelling growth outcomes using variant headship rates

Scenario Name	Average Dwellings per year (2015—2033)			
	HH-08	HH-12	HH-14	HH-14-Return
SNPP-2014 SENS Zero Mig	996	944	947	987
SNPP-2014 SENS Reducing Mig	794	738	742	782
SNPP-2014	620	566	570	608
PG-5yr	582	529	534	571
Natural Change	543	504	509	540
PG-10yr SENS CD Mig	537	489	494	529
SNPP-2012	528	479	484	519
PG-10yr	491	443	448	483

HH-08: the 2008-based DCLG headship rates are applied. **HH-12:** the 2012-based DCLG headship rates are applied. **HH-14:** the 2014-based DCLG headship rates are applied. **HH-14 Return**: the 2014-based DCLG headship rates are applied with adjustments to the 25-34 age-group. In each variant, the communal population assumptions from the 2014-based household projection model have been applied and a consistent vacancy rate of 2.9%

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5 Demographic & Economic Change

Labour Force & Employment Growth

5.1 The PPG states that, as part of the assessment of housing need, the likely change in the level of employment in an area should be considered, as should the size and structure of the labour force (PPG paragraph 2a-018).

5.2 In POGPROUP, it is possible to derive the size and structure of the resident labour force and the number of jobs that an implied level of population growth could support. This is achieved through the application of three key economic assumptions:

1. The **economic activity rates** determine the proportion of the working-age population that is economically active, i.e. the labour force. The labour force includes those who are in work (i.e. 'workers') and also those who are unemployed.

2. The **unemployment rate** determines the proportion of the labour force that is in employment (i.e. the number of workers).

3. The **commuting ratio** determines the balance between the resident number of 'workers' (i.e. employed labour force) and the number of jobs in an area. A commuting ratio greater than 1.0 indicates a net *out*-commute (the number of workers resident in an area is greater than the number of jobs). A commuting ratio less than 1.0 indicates a net *in*-commute (i.e. the number of jobs is greater than the number of resident workers).

5.3 In a trend-based scenario, the size of the resident labour force and the level of employment that can be supported are therefore sensitive to adjustments to these key factors. To illustrate the potential employment growth implications of each of the previous demographic scenarios, the following set of assumptions has been applied.

- **Economic activity rates** for Sunderland have been derived from the 2011 Census, disaggregated by sex and 5-year age-group (ages 16-75+). These age-specific rates have been adjusted in line with the Office for Budget Responsibility (OBR) labour

market trends analysis presented in its 2014 Fiscal Sustainability Report[7]. Age-specific rate adjustments have been applied to the male and female 60+ age-groups only.

- The **unemployment rate** has been aligned to that used in the latest Experian employment forecast for Sunderland (see later sections).

- A fixed **commuting ratio** of 0.96, from the 2011 Census Travel to Work data for Sunderland, has been applied in each year of the forecast period.

5.4 With these economic activity rate, unemployment rate and commuting ratio assumptions, the derived labour force and employment growth estimates for each of the trend scenarios are summarised in Table 9.

Table 9: Sunderland labour force and jobs change, 2015–2033

Scenario	Change 2015 - 2033			Average Annual Employment Growth
	Labour Force (16–75+)	Employed People	Unemployed People	
SNPP-2014 SENS Zero Mig	4,985	7,507	-2,523	433
SNPP-2014 SENS Reducing Mig	645	3,454	-2,809	199
SNPP-2014	-3,383	-303	-3,080	-17
PG-5yr	-4,364	-1,225	-3,140	-71
PG-10yr SENS CD Mig	-5,663	-2,437	-3,225	-141
SNPP-2012	-6,534	-3,270	-3,263	-189
PG-10yr	-6,765	-3,467	-3,298	-200
Natural Change	-8,483	-5,071	-3,411	-292

5.5 In all but the two 'zero net migration' scenarios, the labour force is projected to reduce in size over the 2015–2033 plan period, despite overall population growth, with an estimated annual average decline in the level of employment. These reductions are a result of the continued effect of net out-migration and the gradual ageing of Sunderland's population profile. For example, under the **SNPP-2014** scenario, there is population decline across the 40–60 age-range between 2015–2033 but increases in the 70+ age-range.

5.6 Under the two 'zero net migration' scenarios the situation looks very different. Greater retention of population, results in growth in the size of the labour force and a positive annual growth in

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[7] http://cdn.budgetresponsibility.org.uk/41298-OBR-accessible.pdf

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employment. For the **SNPP-2014 SENS Reducing Mig** scenario, which models a gradual return to a zero net internal migration balance, the estimated annual employment growth is +199 per year.

5.7   To emphasise the demographic effect of ageing and migration upon Sunderland's labour force, the *aggregate* economic activity rate[8] for the 16–75+ age-range is illustrated under the **SNPP-2014** and the **SNPP-2014 SENS Zero Mig** scenarios. In each instance, the aggregate rate reduces over the plan period, with a shallower decline associated with a greater retention of labour force population through lower out-migration (Figure 15).
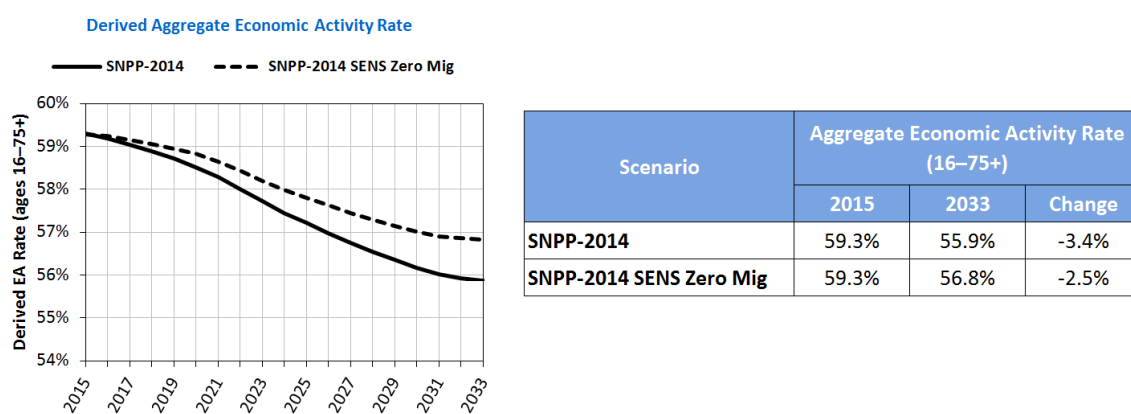

Derived Aggregate Economic Activity Rate

Scenario	Aggregate Economic Activity Rate (16–75+)		
	2015	2033	Change
SNPP-2014	59.3%	55.9%	-3.4%
SNPP-2014 SENS Zero Mig	59.3%	56.8%	-2.5%

Figure 15: Sunderland derived aggregate economic activity rates (ages 16–75+)

5.8   Importantly in each of these scenarios, the commuting balance remains fixed at its 2011 value, with a 0.96 ratio indicating a net inflow to Sunderland.

Experian Employment Forecast

5.9   In the assessment of housing need, the PPG states that the likely future change in the number of jobs in an area should be considered. It is stated that: *"Where the supply of working age population that is economically active (labour force supply) is less than the projected job growth, this could result in unsustainable commuting patterns … and could reduce the resilience of local businesses"* (PPG paragraph 2a-018).

5.10   An employment growth forecast for Sunderland has been supplied by Experian, underpinned by the ONS 2014-based population projection. The forecast provides a, post EU referendum,

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[8] The aggregate economic activity rate is calculated by dividing the total labour force aged 16-75+ by the total population aged 16–75+.

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trajectory of employment growth for the 2015–2033 plan period, measured as annual change in the level of 'workplace-based employment', the statistic that is probably most consistent with that derived from POPGROUP output (Figure 16). With a decline in employment in the short-term, followed by a recovery after 2018, the economic forecast for Sunderland equates to an average annual employment growth of +317 per year over the 2015–2033 plan period.

Figure 16: Sunderland Employment Forecast (Experian, September 2016)

5.11 This annual employment growth forecast can be compared directly to that derived from the demographic scenarios (Figure 17). All but the 'zero net migration' scenarios are estimated to result in an estimated annual decline in employment over the plan period.
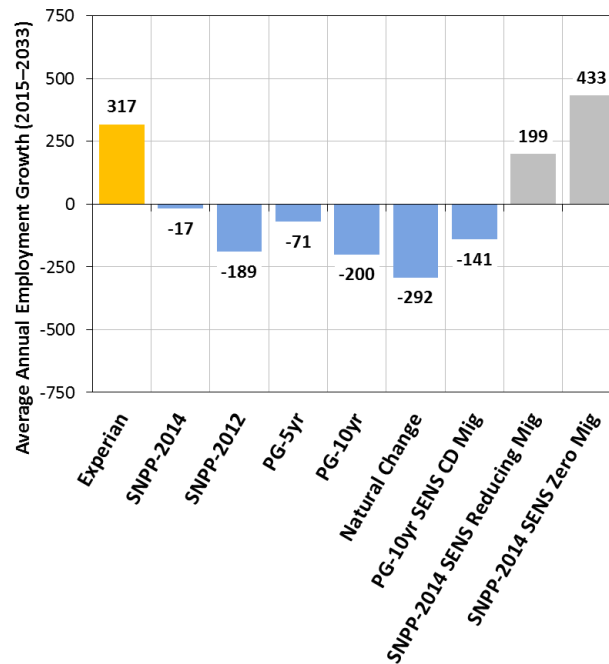
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Figure 17: Average annual jobs growth (2015–2033) - Experian employment forecast (yellow), the demographic scenarios (blue) and SNPP-2014 migration variants (grey)

5.12   The challenge in the alignment of the Experian economic model forecasts and the results of the demographic model is in the application of the key assumptions on economic activity, unemployment and commuting.

5.13   Whilst the unemployment rate has been aligned between the two methods, the Experian forecast assumes that a slightly lower aggregate economic activity rate (under the SNPP-2014 population growth scenario) is achieved, reverting to consistency with the POPGROUP assumption by the end of the plan period. The most significant difference in the Experian assumptions for Sunderland is the larger net in-commute that is implied, suggesting that jobs growth is supported by a greater number of workers commuting from elsewhere (Figure 18).

5.14   It is not clear why the significant changes to economic activity and commuting occur in 2014/15 but they have a similar effect to more gradual reductions over the course of the forecast period. The change in commuting is therefore having the most significant impact upon the relationship between jobs growth and population change.
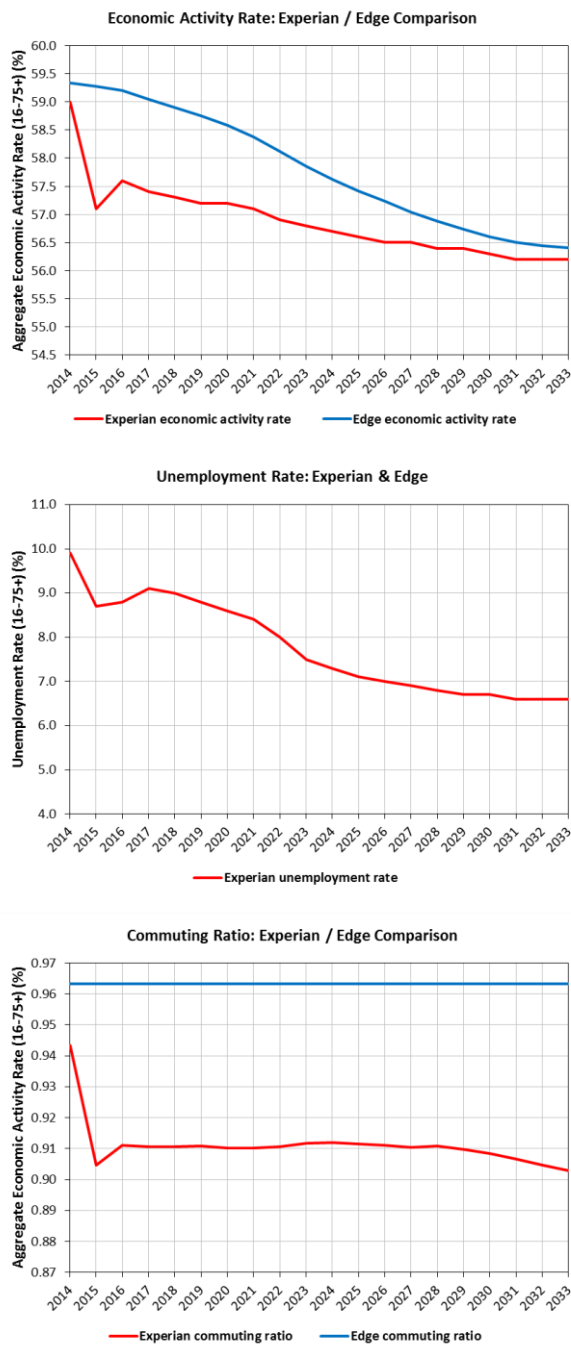
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Figure 18: Comparison of key economic assumptions

5.15   The final section of this analysis seeks to illustrate the sensitivity of the latest Experian employment growth forecast to variations in the key economic assumptions and to compare the resulting dwelling growth outcomes with those estimated from the suite of demographic scenarios presented earlier.

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Aligning Employment & Population Growth

5.16 In POPGROUP, the population, household and dwelling growth implications of the Experian employment forecast can be evaluated using a 'jobs-led' formulation of the POPGROUP forecasting model. In a jobs-led scenario, population growth is linked directly to the change in employment within an area.

5.17 POPGROUP evaluates the impact of an employment growth trajectory by measuring the relationship between the growth (or decline) in employment in an area, the size of the resident labour force and the size of the resident population. Internal 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 resident population and 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.

5.18 Key to determining the level of population growth required to meet a defined jobs growth trajectory are the three assumptions on economic activity, unemployment and commuting. With an ageing population (together with a fixed commuting ratio), higher levels of net in-migration would be needed to support the level of jobs growth in the Experian employment forecast. However, if any of the key economic assumptions were to alter, for example, if levels of economic activity were to increase, or the commuting balance were to change, the required level of population growth needed to support this level of jobs growth would be reduced.

5.19 Using the Experian employment growth trajectory presented in Figure 16 (+317 per year), a jobs-led formulation of the POPGROUP model has been developed which uses the Experian model's unemployment rate but which applies the OBR changes to the age-specific economic activity rates and maintains the commuting ratio at its 2011 level (0.96 ratio).

- **Jobs-led Experian**: total jobs growth of 5,700 (2015–2033)

5.20 For comparison, a series of 'sensitivities' have been tested with alternative economic activity rate and commuting ratio assumptions applied to the same level of employment growth. The range of sensitivities are summarised in Table 10, identified as **SENS A – SENS H**.

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Table 10: Economic assumptions used in the **Jobs-led Experian** scenario and sensitivities

		Jobs-led Experian	SENS A	SENS B	SENS C	SENS D	SENS E	SENS F	SENS G	SENS H
Economic Activity	2011 Census economic activity rates by sex and 5-year age-group (ages 16-75+), with OBR adjustments applied to males and females aged 60-75+ to 2033.	✓			✓			✓		
	2011 Census economic activity rates by sex and 5-year age-group (ages 16-75+), with OBR adjustments applied to males aged 60-75+ and females aged 30-75+ to 2033.		✓			✓			✓	
	2011 Census economic activity rates by sex for the aggregate 16-75+ age-group, maintained throughout the plan period.			✓			✓			✓
Unemployment	ILO (International Labour Organisation) unemployment rate from the Experian assumptions	✓	✓	✓	✓	✓	✓	✓	✓	✓
Commuting	2011 Census commuting ratio for Sunderland (0.96) fixed.	✓	✓	✓						
	2011 Census commuting ratio for Sunderland (0.96) reducing to 0.94 between 2015–2020, then fixed.				✓	✓	✓			
	2011 Census commuting ratio for Sunderland (0.96) reducing to 0.90 between 2015–2033.							✓	✓	✓

5.21 For comparison with the OBR adjustments, two alternative economic activity rate schedules are applied. The first uses the OBR rates but applies additional changes to the 30-59 female age-groups, recognising the likelihood of higher rates of female participation in the labour force, not just in older age-groups. The second maintains a 'constant' aggregate economic activity rate for males and females, ensuring that the overall participation rate is maintained at its base-year level.

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5.22   With regards to commuting, two alternatives are tested for comparison with the 0.96 fixed ratio assumption. In the first variant, the commuting ratio is reduced to 0.94 by 2020. In the second variant the commuting ratio is reduced to 0.90 by 2033. This second variant is more consistent with the assumption that is implied by the Experian economic forecast.

Scenario Results

5.23   The core **Jobs-led Experian** scenario results in an average annual dwelling growth requirement of +812 per year. With a lower overall economic activity rate and a smaller net in-commute, higher migration is required to sustain the local labour force and meet the employment growth target implied by the Experian forecast.

5.24   Sensitivities **A**–**H**, which combine higher rates of economic activity with a reduced commuting ratio, maintain a larger number of workers within Sunderland, both as a resident labour force and as additional in-commuters. This results in less in-migration being required to meet the employment forecast. Under these assumptions, the average annual dwelling requirement reduces to just +12 per year under the **SENS H** option and +745 per year under the **SENS A** scenario dwellings per year (Table 11).

Table 11: Jobs-led Experian sensitivity outcomes **(HH-14)**

Scenario	Change 2015 - 2033				Average per year		
	Population Change	Population Change %	Households Change	Households Change %	Net Migration	Dwellings	Jobs
Jobs-led Experian	**19,436**	**7.0%**	**14,184**	**11.6%**	**904**	**812**	**317**
Jobs-led Experian SENS A	16,516	6.0%	13,017	10.7%	763	745	317
Jobs-led Experian SENS B	3,377	1.2%	7,718	6.3%	131	442	317
Jobs-led Experian SENS C	13,079	4.7%	11,533	9.5%	619	660	317
Jobs-led Experian SENS D	10,244	3.7%	10,400	8.5%	481	595	317
Jobs-led Experian SENS E	-3,999	-1.4%	4,620	3.8%	-198	264	317
Jobs-led Experian SENS F	3,797	1.4%	7,950	6.5%	142	455	317
Jobs-led Experian SENS G	1,047	0.4%	6,848	5.6%	9	392	317
Jobs-led Experian SENS H	-15,394	-5.6%	209	0.2%	-784	12	317

Note that household growth has been assessed using the 2014-based headship rates and the dwelling growth figures using a fixed 2.9% vacancy rate. Note that scenarios are listed in descending order of average annual dwelling growth requirement

5.25   The **SENS B**, **SENS E** and **SENS H** scenarios, which seek to maintain the aggregate rate of economic activity for males and females throughout the plan period, would seem to be

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unrealistic options. The ageing of Sunderland's population, regardless of the level of net migration that is maintained, would imply very high levels of economic participation in the oldest age-groups under these assumptions.

5.26   Likewise, the **SENS F**, **SENS G** and **SENS H** scenarios, which seek to enforce substantial changes to Sunderland's commuting balance, would seem to be less realistic than those which assume more modest shifts in commuting to accommodate employment growth.

5.27   The **SENS A**, **SENS C** and **SENS D** scenarios would appear to represent the most realistic assessment of the dwelling growth implications of the proposed employment forecast, with OBR adjustments to economic activity rates, combined with higher female participation rates and a modest adjustment to Sunderland's commuting balance.

5.28   These three scenarios suggest a dwelling growth range of +595-745 per year. This range is comparable to that implied by the **SNPP-2014** scenario (+570) and the **SNPP-2014 SENS Reducing Mig** scenario (+742), the latter assuming a greater retention of migrants for Sunderland's resident labour force.

5.29   In each of these scenarios, the application of alternative household headship rates (**HH-08** or **HH-14 Return**) would imply a 6-8% higher dwelling growth requirement per year.

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6 Summary

Approach

6.1   This report has provided an update of the demographic evidence to support Sunderland City Council's Local Plan preparation. The analysis has sought to refresh the evidence provided in previous analyses, taking account of a number of new releases of official statistics from the ONS and DCLG, including a 2015 mid-year population estimate, a 2014-based population projection and an accompanying 2014-based household projection. It also includes a new economic forecast for Sunderland, generated following the EU referendum.

6.2   In line with the PPG, Edge Analytics has provided a range of growth scenarios for Sunderland City Council to consider within its Local Plan preparation, using POPGROUP technology to configure an historical perspective on change, as the basis for the development of forecasts of potential demographic and economic growth. Scenario outputs are presented for the plan period, 2015–2033.

Results

6.3   The latest, 2015 mid-year estimate of Sunderland's population has suggested a continuation of the rate of growth experienced since 2011. This population growth is being driven by international migration, countered by a net outflow associated with internal migration, the balance between migration to and from Sunderland from/to other parts of the UK.

6.4   The new mid-year population estimate has been used to update the previous **PG-5yr** and **PG-10yr** scenarios, providing alternative trend scenarios to compare to the latest 2014-based population projection from the ONS (**SNPP-2014**). Whilst in the previous analysis, the **PG-5yr** scenario estimated higher growth than its **SNPP-2012** benchmark, the latest ONS projection suggests substantially higher growth.

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6.5 For the 2015–2033 plan period, the **SNPP-2014** records population growth of 3.1% (+8,560). This remains a relatively modest rate of growth but is higher than the **PG-5yr** (2.7%) and double that associated with the **SNPP-2012** (1.5%). The **SNPP-2014** projection estimates that higher population growth will continue to be driven by international migration but also assumes a lower net outflow through internal migration than has been experienced since 2011.

6.6 The continued net outflow of migrants is an important consideration for Sunderland City Council in planning its housing strategy. For example, a 25% reduction in the net outflow from Sunderland to County Durham (**PG-10yr SENS CD Mig**) results in a 10% increase in the dwelling requirement for Sunderland (relative to the **PG-10yr** scenario). Additional scenario analysis presented here has demonstrated the substantial impact upon Sunderland's population growth and dwelling requirements of a much higher retention of its migrant population.

6.7 DCLG's latest household model projections have provided new evidence and assumptions from which Sunderland's household and dwelling growth estimates can be derived. Scenario outputs generated using 2012-based (**HH-12**) and 2014-based (**HH-14**) household assumptions are very similar (approximately 1% higher in the 2014-based results), reflecting the fact that only minor changes have been made to household headship rate assumptions in the latter. The older, 2008-based (**HH-08**) household model assumptions, with headship rates that drive a higher rate of household growth, result in household and dwelling growth outcomes that are approximately 8% higher than the latest 2014-based evidence. Alternative assumptions, which consider a return to higher rates of household formation in young adults (aged 25-34) suggested a potential 6% uplift in dwelling growth.

6.8 The alignment of demographic and economic evidence continues to be a challenging proposition, with a relatively low population growth projected for Sunderland and an ageing population profile having a significant influence on the future size and shape of its labour force. This analysis has used the new demographic data and assumptions to update the assessment of Sunderland's most recent (Experian) economic growth forecast. The relationship between migration, commuting, economic activity rates and unemployment are the key assumptions to consider in this assessment. The scenario analysis has presented a range of dwelling growth estimates associated with variant assumptions on these parameters.

6.9 A summary of the average annual dwelling growth outcomes for the full range of demographic and jobs-led scenarios is summarised below, for the 2015–2033 plan period (Figure 19). The new

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SNPP-2014 benchmark records a dwelling requirement of **+570** per year over the 2015–2033 plan period, rising to **+620** per year with higher rates of household formation (**HH-08**).

6.10   In seeking to align the Experian employment growth forecasts with housing requirements, a number of variant assumptions have been tested. The **SENS A**, **SENS C** and **SENS D** scenarios would appear to represent the most realistic assessment of the dwelling growth implications of the proposed employment forecast, with OBR adjustments to economic activity rates, combined with higher female participation rates and a modest adjustment to Sunderland's commuting balance.

6.11   These three scenarios suggest a dwelling growth range of +595-745 per year. This range is comparable to that implied by the **SNPP-2014** scenario (+570) and the **SNPP-2014 SENS Reducing Mig** scenario (+742), the latter assuming a greater retention of migrants for Sunderland's resident labour force.
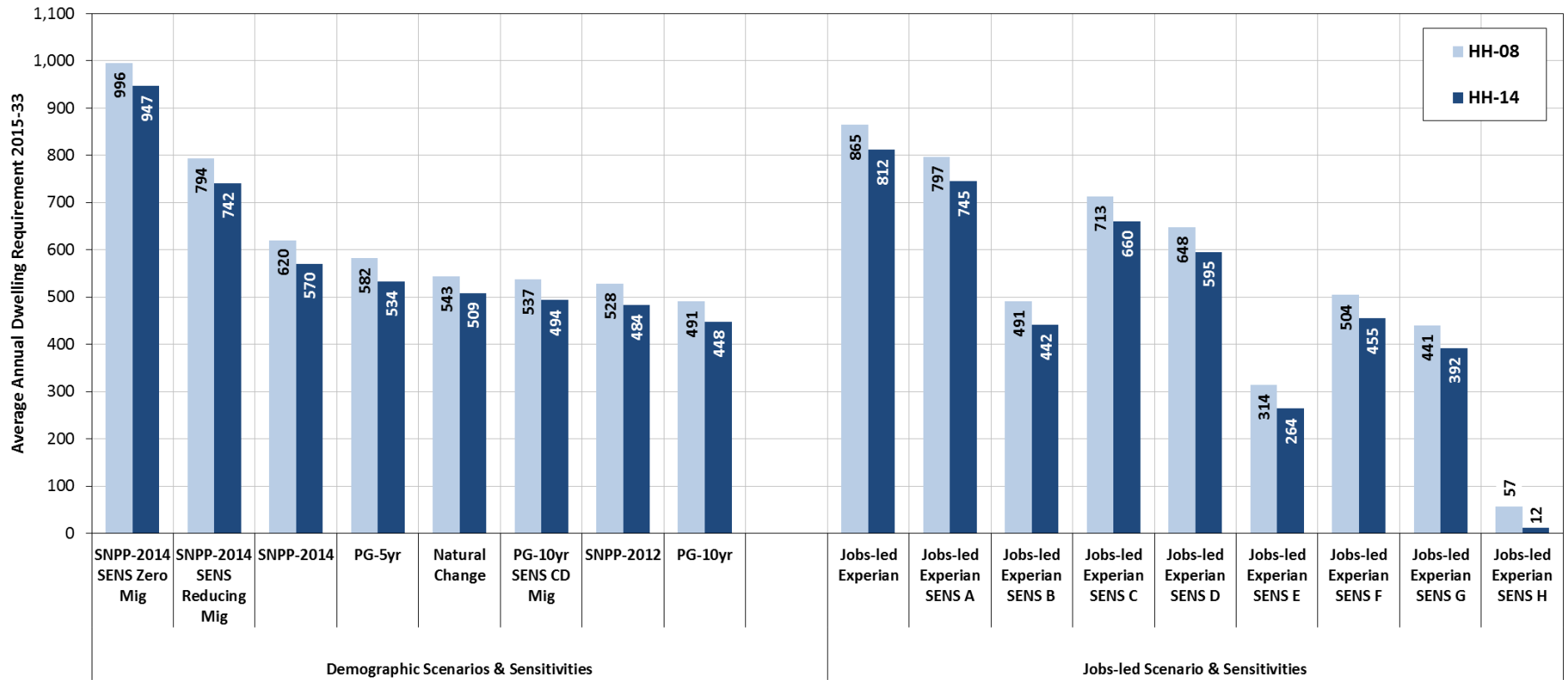
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Figure 19: Sunderland, summary of average annual dwelling growth outcomes, 2015–2033

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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 20) 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 21) sits alongside the population model, providing a headship rate model for household projections and an economic activity rate model for labour-force projections.

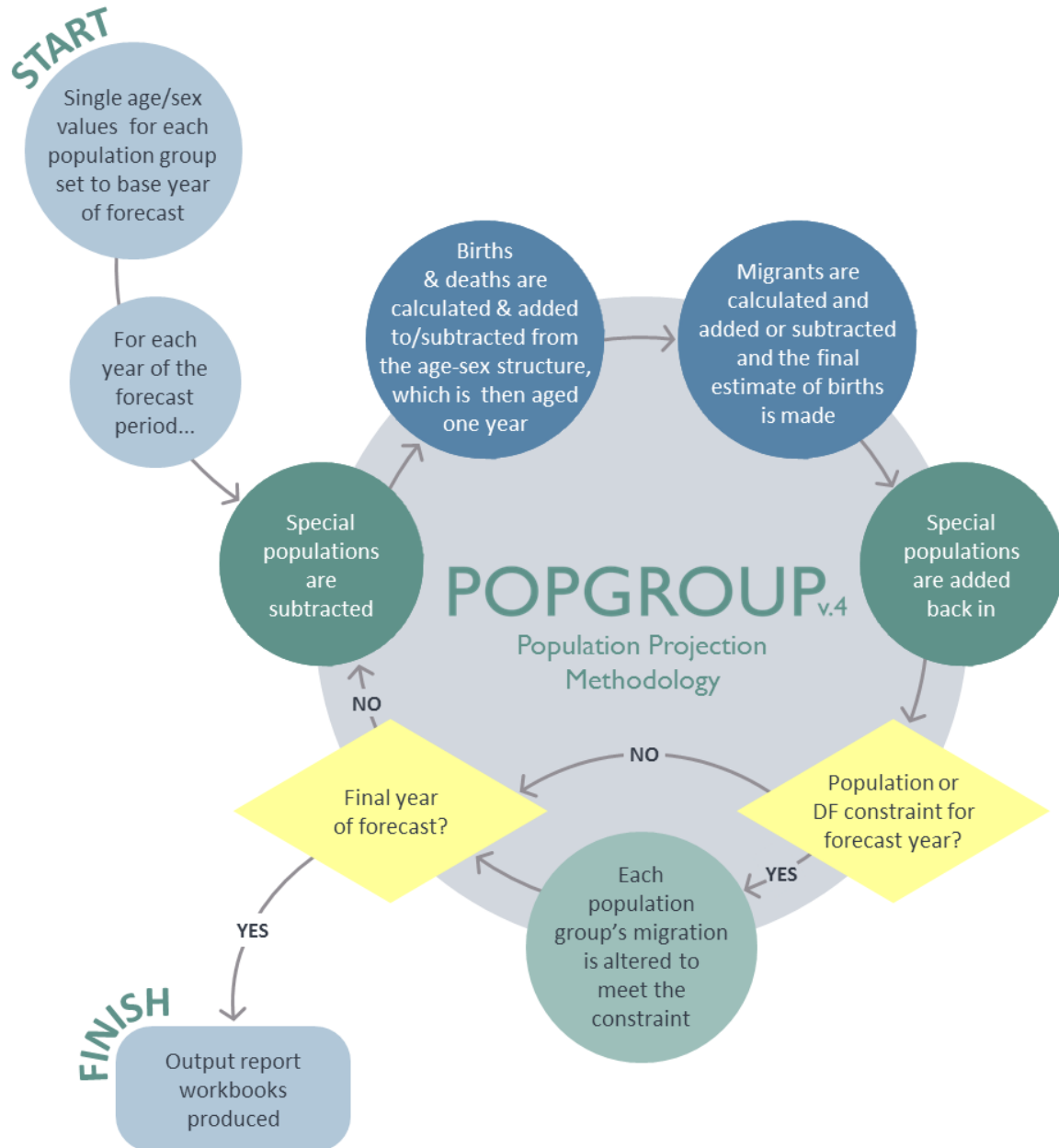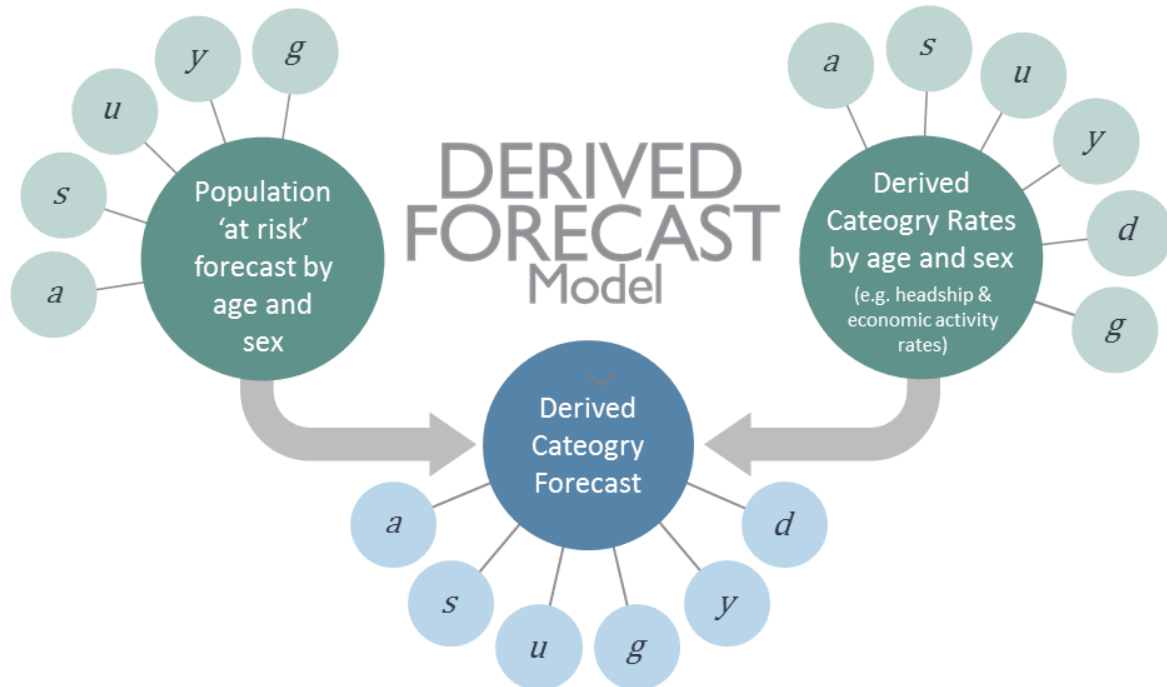A.4   For further information on POPGROUP, please refer to the Edge Analytics website: http://edgeanalytics.co.uk/popgroup.

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Figure 20: POPGROUP population projection methodology

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Figure 21: Derived Forecast (DF) methodology

Appendix B

Data Inputs & Assumptions

Introduction

B.1 Edge Analytics has developed a suite of demographic scenarios for the City of Sunderland using POPGROUP v.4 and the Derived Forecast model. The POPGROUP suite of demographic models draws data from a number of sources, building an historical picture of population, households, fertility, mortality and migration on which to base its scenario forecasts. Using historical data evidence for 2001–2015, 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.2 The following scenarios and sensitivities have been produced:

- **SNPP-2014**
- **SNPP-2012**
- **PG-5yr**
- **PG-10yr**
- **Natural Change**
- **PG-10yr SENS CD Mig**
- **SNPP-2014 SENS Zero Mig**
- **SNPP-2014 SENS Reducing Mig**
- **Jobs-led Experian**
- **Jobs-led Experian SENS A**
- **Jobs-led Experian SENS B**
- **Jobs-led Experian SENS C**
- **Jobs-led Experian SENS D**
- **Jobs-led Experian SENS E**
- **Jobs-led Experian SENS F**
- **Jobs-led Experian SENS G**
- **Jobs-led Experian SENS H**

In the following sections, a narrative on the data inputs and assumptions underpinning the scenarios and sensitivities is presented.

October 2016

Population, Births & Deaths

Population

B.3   In each scenario, historical population statistics are provided by the mid-year population estimates (MYEs), 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.4   In the **SNPP-2014** scenario and sensitivities, the historical MYEs are used up to 2014. In the **SNPP-2014** scenario future population counts are provided by single-year of age and sex from 2014 to ensure consistency with the trajectory of the ONS 2014-based SNPP.

B.5   In the **SNPP-2012** scenario, the historical MYEs are used up to 2012. From 2012, future population counts are provided by single-year of age and sex to ensure consistency with the trajectory of the ONS 2012-based SNPP.

B.6   In the other scenarios, the historical MYEs are used up to 2015.

Births & Fertility

B.7   In each scenario, historical mid-year to mid-year counts of births by sex have been sourced from the ONS MYEs.

B.8   In the **SNPP-2014** scenario and sensitivities, historical births are used from 2001/02 to 2013/14. In the **SNPP-2014** scenario future counts of births are specified from 2014/15 to ensure consistency with the 2014-based official projection.

B.9   In the **SNPP-2012** scenario, historical births are used from 2001/02 to 2011/12. From 2012/13, future counts of births are specified, to ensure consistency with the 2012-based official projection.

B.10   In all other scenarios, historical births are used from 2001/02 to 2014/15. From 2015/16 (2014/15 in the **SNPP-2014** sensitivities), an area-specific age-specific rate (ASFR) schedule, derived from the ONS 2014-based SNPP, is included in the POPGROUP model assumptions. Long-

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term assumptions on changes in age-specific fertility rates are taken from the ONS 2014-based SNPP.

B.11   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.12   In each scenario, historical mid-year to mid-year counts of deaths by 5-year age group and sex have been sourced from the ONS MYEs.

B.13   In the **SNPP-2014** scenario and sensitivities, historical deaths are used from 2001/02 to 2013/14. In the **SNPP-2014** scenario, future counts of deaths are specified from 2014/15 to ensure consistency with the 2014-based official projection.

B.14   In the **SNPP-2012** scenario, historical deaths are used from 2001/02 to 2011/12. From 2012/13, future counts of deaths are specified, to ensure consistency with the 2012-based official projection.

B.15   In all other scenarios, historical deaths are used from 2001/02 to 2014/15. From 2015/16 (2014/15 in the **SNPP-2014** sensitivities), an area-specific age-specific mortality rate (ASMR) schedule, derived from the ONS 2014-based SNPP, is included in the POPGROUP model assumptions. Long-term assumptions on changes in age-specific mortality rates are taken from the ONS 2014-based SNPP.

B.16   In combination with the 'population-at-risk' (i.e. the whole 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.

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Migration

Internal Migration

B.17   In each scenario, historical mid-year to mid-year estimates of internal in- and out-migration by 5-year age group and sex 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 the Higher Education Statistics Agency (HESA).

B.18   In the **SNPP-2014** scenario, historical counts of internal in and out-migrants are used from 2001/02 to 2013/14. From 2014/15, future counts of migrants are specified, to ensure consistency with the 2014-based official projection.

B.19   In the **SNPP-2014 SENS Zero Mig** sensitivity the inflow and outflow of internal migrants results in a net migration balance of zero, for all years of the forecast period. The **SNPP-2014 SENS Reducing Mig** sensitivity also seeks to achieve zero net internal migration but does so through a gradual change in the net balance over the course of the forecast period.

B.20   In the **SNPP-2012** scenario, historical counts of internal in and out-migrants are used from 2001/02 to 2011/12. From 2012/13, future counts of migrants are specified, to ensure consistency with the 2012-based official projection.

B.21   In the **Natural Change** scenario, historical counts of internal in and out-migrants are used from 2001/02 to 2014/15. From 2015/16, internal in- and out-migration flows are set to zero in each year in the forecast period (i.e. no in- or out-migration occurs).

B.22   In the **PG** scenarios, historical counts of internal in and out-migrants are used from 2001/02 to 2014/15. From 2015/16, future internal migration flows are based on the area-specific historical migration data. In the **PG-5yr** scenario, a *five* year internal migration history is used (2010/11 to 2014/15). In the **PG-10yr** scenario, a *ten* year history is used (2005/06 to 2014/15). In the **PG-10yr SENS CD Mig** sensitivity, internal migration rates are based on the last 10 years of historical evidence (2005/06 to 2014/15), with net internal out-migration reduced by 97 in each year of the forecast period.

B.23   In the alternative trend scenarios and sensitivity (i.e. **PG-5yr**, **PG-10yr**, **PG-10yr SENS CD Mig**), 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.

B.24   In the case of internal <u>in</u>-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 <u>out</u>-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 Sunderland, it comprises all districts which cumulatively contributed 70% of migrants into the North East LEP over the 2008/09–2014/15 period.

B.25   In the **Jobs-led** scenarios and sensitivities, historical counts of internal in and out-migrants are used from 2001/02 to 2014/15. From 2015/16, these scenarios then 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. In the **Jobs-led** scenario and sensitivities, the profile of internal migrants is defined by an ASMigR schedule, derived from the ONS 2014-based SNPP.

International Migration

B.26   Historical mid-year to mid-year counts of immigration and emigration by 5-year age group and sex 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.27   In <u>all</u> scenarios, future international migrant counts are specified.

B.28   In the **SNPP-2014** scenario and sensitivities, historical counts of migrants are used from 2001/02 to 2013/14. From 2014/15, the international in- and out-migration counts are drawn directly from the 2014-based official projection.

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B.29 In the **SNPP-2012** scenario, historical counts of migrants are used from 2001/02 to 2011/12. From 2012/13, the international in- and out-migration counts are drawn directly from the 2012-based official projection.

B.30 In the **Natural Change** scenario, historical counts of international in and out-migrants are used from 2001/02 to 2014/15. From 2015/16, the migration counts for both in- and out-migration are set to zero in each year in the forecast period (i.e. no in- or out-migration occurs).

B.31 In the **PG** scenarios, historical counts of international in and out-migrants are used from 2001/02 to 2014/15. From 2015/16, future international migration counts are based on the area-specific historical migration data. In the **PG-5yr** scenario, a five year international migration history is used (2010/11 to 2014/15). In the **PG-10yr** scenario and the **PG-10yr SENS CD Mig** sensitivity, a ten year history is used (2005/06 to 2014/15). In the **PG** scenarios and sensitivity, an ASMigR schedule of rates is derived from the relevant migration history and is used to distribute future counts by single year of age.

B.32 Implied within the international migration component of change in the **PG** scenarios and sensitivity (i.e. **PG-5yr**, **PG-10yr** and **PG-10yr SENS CD Mig**) 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.

B.33 In the **Jobs-led** scenario and sensitivities, historical counts of international in and out-migrants are used from 2001/02 to 2014/15. From 2015/16, international migration counts are taken from the ONS 2014-based SNPP (i.e. counts are consistent with the **SNPP-2014** scenario). An ASMigR schedule of rates from the ONS 2014-based SNPP is used to distribute future counts by single year of age.

Households & Dwellings

B.34 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."*

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B.35   In POPGROUP, a dwelling is defined as a unit of accommodation which can either be occupied by one household or vacant.

B.36   In all scenarios and sensitivities, 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, 2012-based and 2014-based household projection model from the DCLG. The 2014-based model was released by the DCLG in July 2016, and is underpinned by the 2014-based SNPP from ONS.

Household Headship Rates

B.37   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"*[9].

B.38   The household headship rates used in the POPGROUP modelling have been taken from the latest DCLG 2014-based household projection model, which is underpinned by the ONS 2014-based SNPP. The DCLG household projections are derived through the application of projected headship rates to a projection of the private household population. The methodology used by the 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 period.
- **Stage Two** provides the detailed 'household-type' projection by age-group, controlled to the previous Stage One totals.

B.39   In POPGROUP, the Stage Two headship rates have been applied by 10-year age group in an 8-fold household type classification (Table 12). The following scenario identifiers have been applied:

- **HH-08**: 2008-based DCLG headship rates, scaled to the 2011 DCLG household total, following the original trend thereafter (to ensure a consistent starting point).
- **HH-12**: 2012-based DCLG headship rates.
- **HH-14**: 2014-based DCLG headship rates.

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[9] 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

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- **HH-14 Return:** 2014-based DCLG headship rates, with the rates for the 25–34 age-group returned to their 2001 values by 2024, following the original trend thereafter.

Table 12: DCLG Stage Two headship rate classification household type classification

DCLG Category	Description
One person male	One person households: Male
One person female	One person: Female
Couple no child	One family and no others: Couple households: No dependent children
Cple+adlts no child	A couple and one or more other adults: No dependent children
One child	Households with one dependent child
Two children	Households with two dependent children
Three+ children	Households with three or more dependent children
Other households	Other households with two or more adults

Communal Population Statistics

B.40   Household projections in POPGROUP exclude the population 'not-in-households' (i.e. the communal/institutional population). These data are drawn from the DCLG 2014-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.41   For ages 0–74, the number of people in each age group not-in-households is 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.

Vacancy Rate

B.42   The relationship between households and dwellings is modelled using a 'vacancy rate', sourced from the 2011 Census[10]. The vacancy rate is calculated using statistics on households (occupied household spaces) and dwellings (shared and unshared).

B.43   A vacancy rate of 2.9% for Sunderland has been applied, fixed throughout the forecast period. Using the vacancy rate, the 'dwelling requirement' of each household growth trajectory has been evaluated.

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[10] Census Table KS401EW: Dwellings, household spaces and accommodation type

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Labour Force & Jobs

B.44   Apart from in the **Jobs-led** scenarios and sensitivities, the labour force and jobs implications of the population growth trajectory are evaluated through the application of three key data items: economic activity rates, an unemployment rate and a commuting ratio.

B.45   In the **Jobs-led** scenarios and sensitivities, these assumptions are used to determine the level of population growth required by the defined jobs growth trajectory.

Economic Activity Rates

B.46   The level of labour force participation is recorded in the economic activity rates.

B.47   Economic activity rates by five year age group (ages 16-75+) and sex have been derived from Census statistics.

B.48   Between the 2001 and 2011 Censuses, rates of economic activity increased, most notably for females and males in the older age groups (Figure 22).
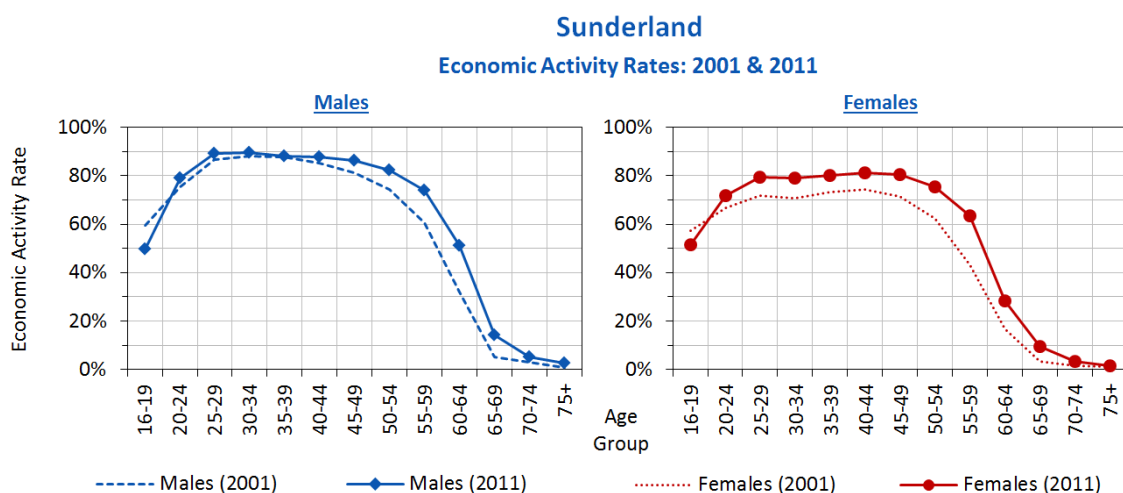

Figure 22: Sunderland economic activity rates: 2001 and 2011 Census comparison (source: ONS)

B.49   Three alternative sets of economic activity rates have been considered in this analysis, with detail provided in the following paragraphs.

- **OBR**
- **OBR adjusted**
- **Aggregate fixed**

OBR Rates

B.50   The Office for Budget Responsibility (OBR) has undertaken analysis of labour market trends in its 2014 Fiscal Sustainability Report[11]. Included within its analysis is a forecast of changing economic activity rates for males and females, extending to a long-term 2066 forecast horizon. This forecast has been used to generate OBR economic activity rates for Sunderland. Adjustments have been made for the older age groups (60–75+) (Table 13 and Figure 23). These rates have been applied in all demographic scenarios, the **Jobs-led Experian** scenario, **SENS C** and **SENS F**.

Table 13: OBR economic activity rate change (2011–2033)

OBR Economic Activity Rates Change 2011–2033			
Males		**Females**	
16–19	0%	16–19	0%
20–24	0%	20–24	0%
25–29	0%	25–29	0%
30–34	0%	30–34	0%
35–39	0%	35–39	0%
40–44	0%	40–44	0%
45–49	0%	45–49	0%
50–54	0%	50–54	0%
55–59	0%	55–59	0%
60–64	16%	60–64	71%
65–69	48%	65–69	96%
70–74	29%	70–74	107%
75+	52%	75+	266%
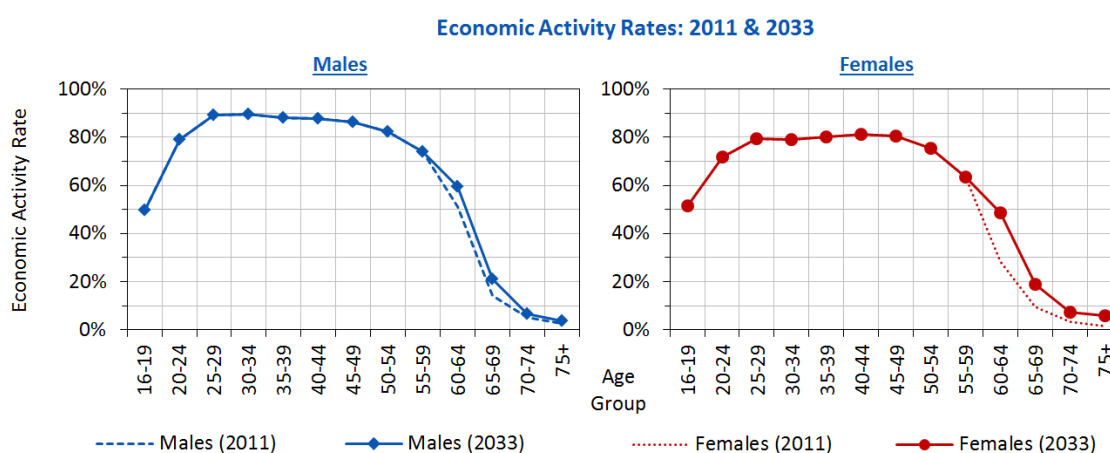
Figure 23: OBR economic activity rate profile for Sunderland

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[11] http://cdn.budgetresponsibility.org.uk/41298-OBR-accessible.pdf

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OBR Adjusted Rates

B.51   In the **SENS A**, **D** and **G** sensitivities, OBR economic activity rate adjustments have been applied
to the older age groups (60–75+), with additional adjustments applied for females aged 30–59
(Table 14 and Figure 24).

Table 14: OBR adjusted economic activity rate change (2011–2033)

OBR Adjusted Economic Activity Rates Change 2011–2033			
Males		**Females**	
16–19	0%	16–19	0%
20–24	0%	20–24	0%
25–29	0%	25–29	0%
30–34	0%	30–34	5%
35–39	0%	35–39	5%
40–44	0%	40–44	5%
45–49	0%	45–49	5%
50–54	0%	50–54	5%
55–59	0%	55–59	5%
60–64	16%	60–64	71%
65–69	48%	65–69	96%
70–74	29%	70–74	107%
75+	52%	75+	266%
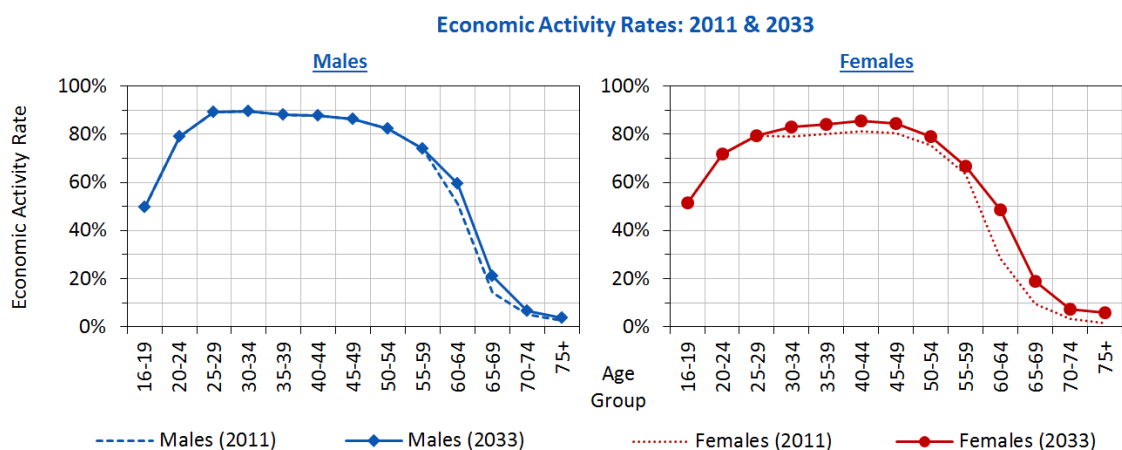
Figure 24: OBR adjusted economic activity rate profile for Sunderland

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Aggregate Fixed Rates

B.52   In the **SENS B**, **E** and **H** sensitivities, a fixed aggregate economic activity rate for males and females has been applied, maintaining the overall participation rate at its 2011 level. The resulting economic activity rate profile for ages 16–75+ is presented in Figure 25.
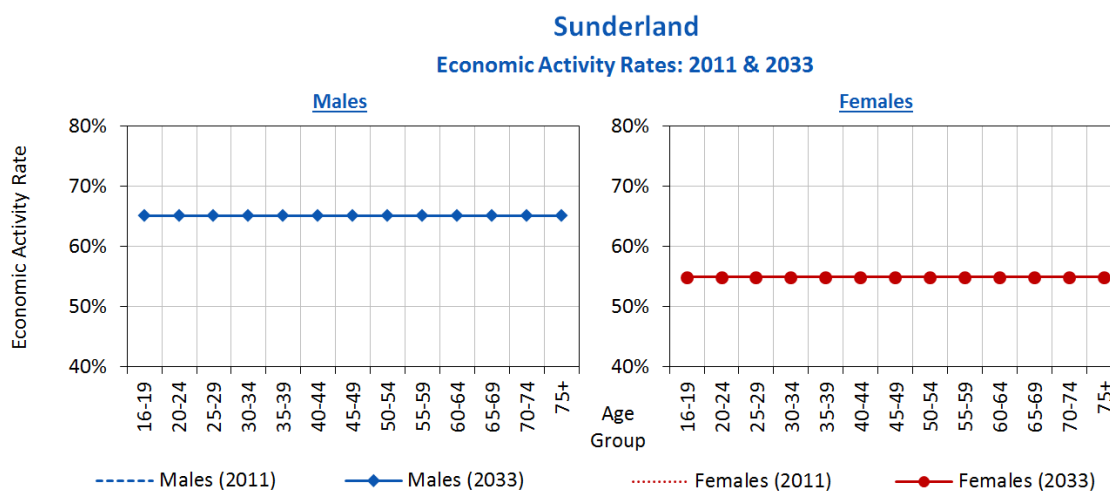

Sunderland
Economic Activity Rates: 2011 & 2033

Figure 25: Aggregate fixed economic activity rate profile for Sunderland

Commuting Ratio

B.53   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.

B.54   A commuting ratio greater than 1.00 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 1.00 indicates that the number of jobs in the district exceeds the size of the labour force, resulting in a net in-commute.

B.55   From the 2011 Census 'Travel to Work' statistics, published by ONS in July 2014, a commuting ratio has been derived for Sunderland. This is compared to the 2001 Census value in Table 15.

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Table 15: Commuting Ratio Comparison

Sunderland		2001 Census	2011 Census
Workers	*a*	114,095	121,511
Jobs	*b*	117,015	126,157
Commuting Ratio	*a/b*	**0.98**	**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*.

B.56   In all demographic scenarios, the **Jobs-led Experian** scenario, **SENS A** and **SENS B**, the 2011 Census commuting ratio of 0.96 has been applied, fixed throughout the forecast period.

B.57   In **SENS C**, **D**, and **E**, the 2011 Census commuting ratio for Sunderland (0.96) has been applied, reducing to 0.94 between 2015–2020, then fixed.

B.58   In **SENS F**, **G**, and **H**, the 2011 Census commuting ratio for Sunderland (0.96) has been applied, reducing to 0.90 between 2015–2033. This second variant is more consistent with the assumption that is implied by the Experian economic forecast.

Unemployment Rate

B.59   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.

B.60   In all scenarios and sensitivities, the unemployment rate has been aligned to that used in the latest Experian employment forecast for Sunderland.

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