Pembrokeshire

Updating the LDP Demographic Evidence

December 2020

edge analytics

Nexus | Discovery Way | University of Leeds | Leeds | LS2 3AA
0113 819 5087 | www.edgeanalytics.co.uk

Acknowledgements

Demographic statistics used in this report have been derived from data from the Office for National Statistics licensed under the Open Government Licence v.3.0.

The authors of this report do not accept liability for any costs or consequential loss involved following the use of the data and analysis referred to here; this is entirely the responsibility of the users of the information presented in this report.

Contents

1 Introduction

Context

1.1 Pembrokeshire County Council (PCC) is preparing a replacement Local Development Plan (LDP), for the area of the County which excludes the Pembrokeshire Coast National Park (PCNP), referred to in this analysis as 'Pembrokeshire-Out' (Figure 1). The LDP is to be informed by the latest demographic statistics and forecasts, updating the previous evidence provided to the Council in 2018.

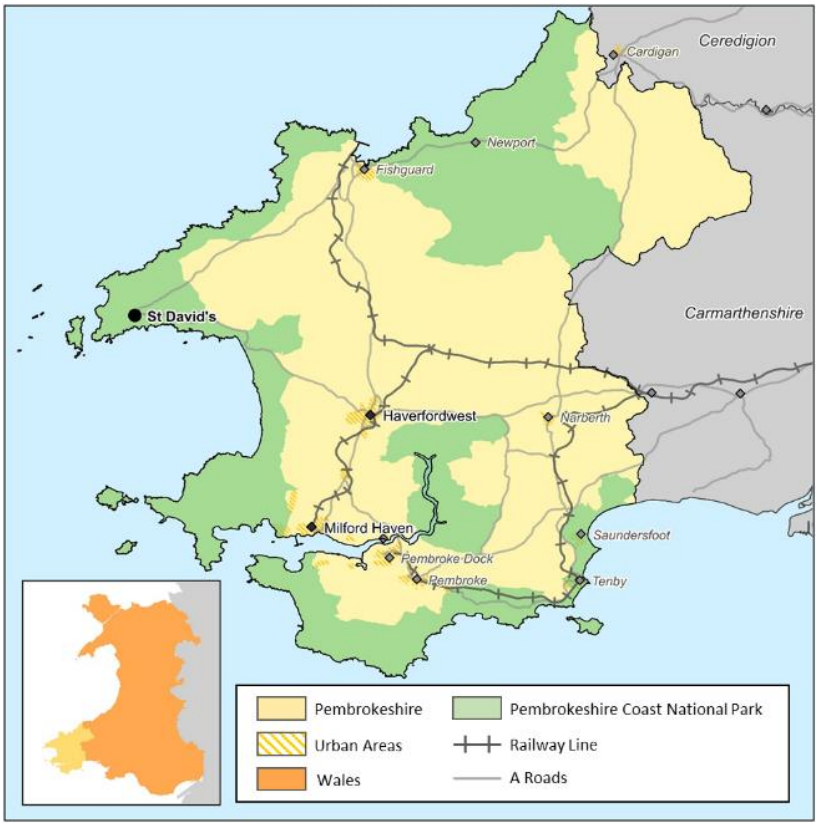


Figure 1: Pembrokeshire and Pembrokeshire Coast National Park – Geographical Context

1.2 In August 2020, the Welsh Government (WG) published its 2018-based population and household projections, a first update since the 2014-based equivalents. These new WG projections provide a *baseline* for the LDP demographic evidence, to be considered alongside a range of other growth scenarios, including trend and housing-led alternatives. These additional scenarios incorporate small-area mid-year population estimates for 2018, published by the Office for National Statistics (ONS) in October 2019[1].

[1] https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/bulletins/annualsmallareapopulationestimates/mid2018

Approach

1.3 Edge Analytics is a specialist in Data Science, with a particular expertise in demographic modelling and forecasting and has worked with the majority of local planning authorities across Wales in the development and presentation of evidence to support LDP formulation.

1.4 Edge Analytics has used POPGROUP technology to configure a new range of growth scenarios for Pembrokeshire-Out, incorporating demographic statistics from both ONS and WG, to produce forecasts for a 2017–2033 plan period.

1.5 As in the 2018 analysis, historical demographic statistics for Pembrokeshire-Out have been derived from the Census Output Area (OA) data for Pembrokeshire Unitary Authority (UA) (i.e. Pembrokeshire-Out plus PCNP). A proportional split of each OA has been calculated, estimating the extent to which it falls outside or inside the PCNP boundary. The resultant OA definition has been used to generate historical demographic statistics for Pembrokeshire-Out, which have provided the basis for the scenario development.

1.6 All scenarios are based on historical evidence for the period 2001–2018 and use household growth assumptions from the Welsh Government's 2018-based household projection model, with an additional sensitivity considering the impact of the 2008-based household growth assumptions on the projected dwelling growth under the demographic scenarios.

1.7 Section 2 updates the Pembrokeshire-Out Area Profile with the latest demographic statistics. Section 3 presents the new suite of growth scenarios, with Section 4 summarising the updated evidence.

1.8 Appendix A presents Pembrokeshire-Out scenario outcomes for an alternative 2021–2033 period, with outcomes for Pembrokeshire UA summarised in Appendix B. Remaining Appendices provide supplementary detail on Pembrokeshire's migration history, the POPGROUP forecasting methodology, plus the data and assumptions used in the formulation of the analysis.

2 Area Profile

Population Change

2.1 Since 2001, population of Pembrokeshire-Out has increased by 13%, from an estimated 90,936 in 2001 to 102,792 in 2018 (Figure 2).

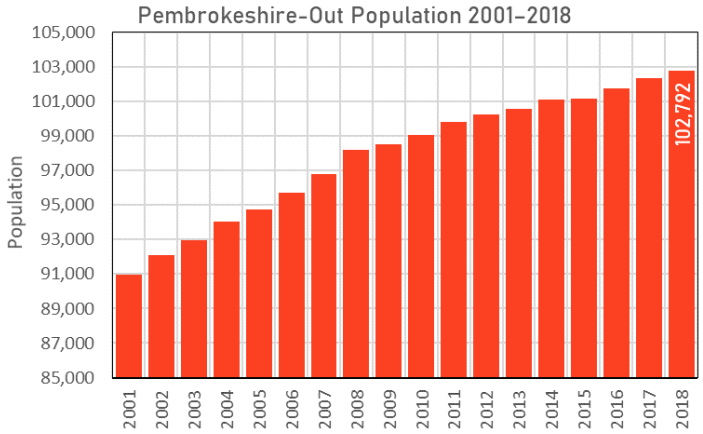


Figure 2: Pembrokeshire-Out - Population Change 2001-2018 (Source: ONS)

2.2 Pembrokeshire-Out has continued to experience a rate of population growth that exceeds the Welsh average, at approximately 0.7% per year between 2001–2018. The growth has been particularly strong in the first half of the period with a 2001–2008 average annual growth of 1.1%, reducing to 0.5% thereafter (2009–2018). The area covered by the PCNP has been subject to population decline since 2009 (Figure 3).

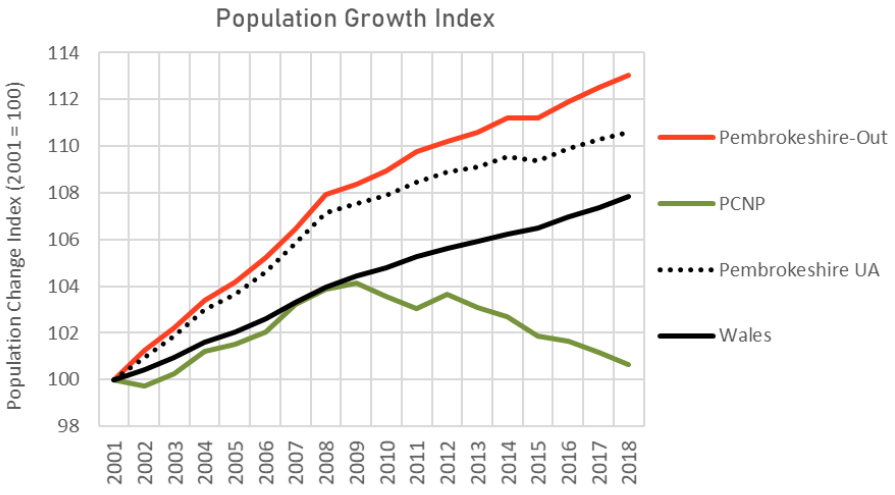


Figure 3: Pembrokeshire-Out - Population Growth Index 2001–2018 (Source: ONS)

2.3 An examination of the County's components of change profile (Figure 4) reveals that net migration (the balance between inflow and outflow of population moving to and from Pembrokeshire-Out) has been the dominant driver of population growth in all years since 2001/02, even despite a notable fall in net in-migration following the global financial crisis in 2007/08. Since 2015, the average annual net migration balance has been approximately +700 per annum.

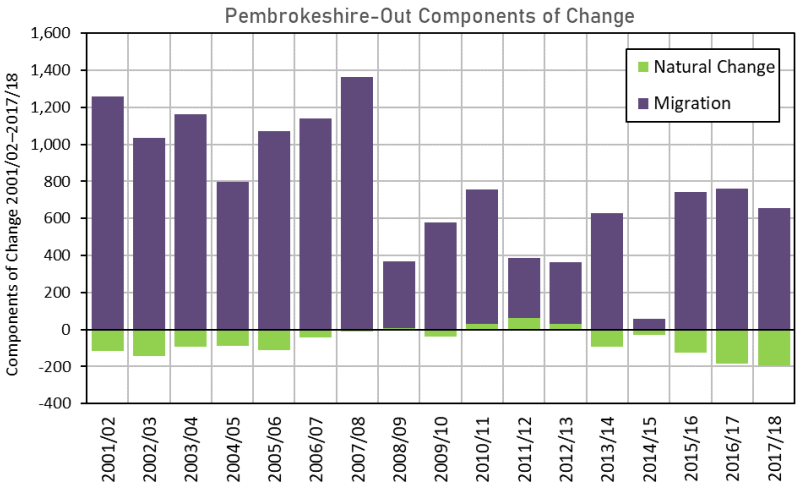


Figure 4: Pembrokeshire-Out - Components of Population Change 2001/02–2017/18 (Source: ONS)

2.4 Natural change (the balance between births and deaths) has had a much smaller and predominantly negative impact on population growth in Pembrokeshire-Out, with all but four years since 2001/02 recording a higher number of deaths than births.

2.5 The rate at which new homes have been built in Pembrokeshire-Out has had an important impact upon its population growth trajectory (Figure 5).

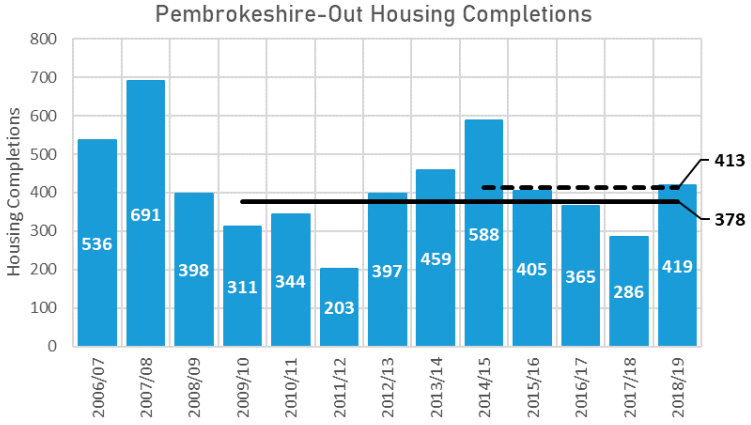


Figure 5: Pembrokeshire-Out - Housing Completions 2006/07–2018/19

2.6 In the last 10 years, historical housing completions have fluctuated from a low of 203 in 2011/12 to 588 in 2014/15, averaging 378 dwellings per annum (dpa). Over the last 5 years, the annual average completion rate has been 413 dpa.

2.7 An index of population growth for four broad age-groups, reveals the important demographic changes that are taking place within Pembrokeshire-Out, ageing its population over time (Figure 6). There has been significant growth in the older age-groups, 65–79 and 80+, with the number of 80+ year olds in Pembrokeshire-Out increasing by over 60% between 2001–2018. There has been relative stability in the size of the working age population (16–64-year olds), whilst the number of children below the age of 15 has reduced, maintaining a level approximately 95% of its 2001 total.

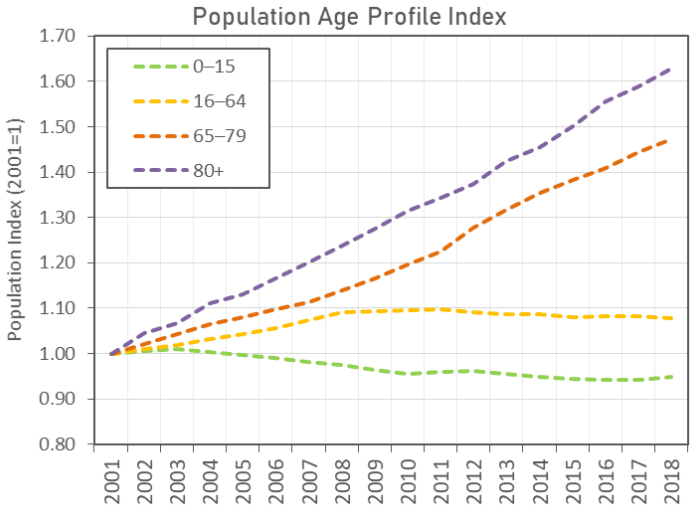


Figure 6: Pembrokeshire-Out – Population Age Profile Index 2001–2018

3 Demographic Scenarios

Scenario Definition

3.1 POPGROUP technology (see Appendix A) has been used to configure a suite of growth scenarios for Pembrokeshire-Out (Table 1). Additional detail on scenario data inputs and assumptions is provided in Appendix E.

3.2 The WG scenarios include the 2014-based 'principal' projection, plus the full suite of variants that make up the 2018-based WG projections.

3.3 POPGROUP (PG) trend scenarios consider growth outcomes based on a continuation of 2-year, 10-year and long-term migration histories, incorporating a 2018 base year. A variant on the **PG-Long Term** scenario is presented, considering growth outcomes that are underpinned by the higher fertility and mortality assumptions identified in the WG 2018-based round of projections.

3.4 The dwelling-led scenarios consider how a continuation of a 10-year and 5-year history of housing completion rates would impact upon future population growth, again with a 2018 base year. A further dwelling-led scenario models the potential impact of the Replacement LDP target of +425 dpa on population growth.

3.5 For all scenarios, household and dwelling growth is estimated using assumptions from the WG 2018-based household projection model, with an additional sensitivity applied to demographic scenarios only and investigating the impact of the 2008-based household model assumptions on projected dwelling growth. In modelling the relationship between households and dwellings, a vacancy rate of 8.1% has been applied, derived from 2011 Census statistics.

3.6 The 2001–2033 population growth trajectories for all scenarios are presented in Figure 8. In Table 2, each of the scenarios is summarised in terms of population and household growth for the 2017–2033 LDP period, alongside the average annual net migration and dwelling growth outcomes. An additional summary of the scenario outcomes for the 2021–2033 period is presented in Appendix A.

Table 1: Scenario definition

1.	WG-2014	Replicates the WG 2014-based *Principal* population projection, using historical population evidence for 2001–2014.
2.	WG-2018	Replicates the WG 2018-based *Principal* population projection, using historical population evidence for 2001–2018.
3.	WG-2018 (HIGHPOP)	Replicates the WG 2018-based *High Population* projection, using historical population evidence for 2001–2018.
4.	WG-2018 (LOWPOP)	Replicates the WG 2018-based *Low Population* projection, using historical population evidence for 2001–2018.
5.	PG Long Term*	Uses an ONS 2018 MYE base year and calibrates its migration assumptions from a 17-year historical period (2001/02–2017/18).
6.	PG Long Term (Fert-H Mort-H)	Uses an ONS 2018 MYE base year and calibrates its migration assumptions from a 17-year historical period (2001/02–2017/18) and its fertility and mortality assumptions from the WG 2018-based High Population variant scenario.
7.	PG 10yr*	Uses an ONS 2018 MYE base year and calibrates its migration assumptions from a 10-year historical period (2008/09–2017/18).
8.	PG 2yr	Uses an ONS 2018 MYE base year and calibrates its migration assumptions from a 2-year historical period (2016/17–2017/18).
9.	Dwelling-led (425 dpa)*	Models the population impact of an average dwelling growth of 425 dpa, based on Pembrokeshire-Out's LDP target. This average dwelling number is fixed throughout the plan period.
10.	Dwelling-led (5-yr Average)*	Models the population impact of an average dwelling growth of 413 dpa, based on an 5-year history of housing completions (2014/15–2018/19). This average dwelling number is fixed throughout the plan period.
11.	Dwelling-led (10-yr Average)*	Models the population impact of an average dwelling growth of 378 dpa, based on an 10-year history of housing completions (2009/10–2018/19). This average dwelling number is fixed throughout the plan period.

** These scenarios are an update on those featured in the 2018 analysis. They include two more years of mid-year estimate data and for this reason the resulting scenario outcomes differ to those presented in the 2018 reports.*

Scenario Summary

3.7 Population change for the 2017–2033 period ranges from -5.9% under the **Net Nil** scenario to 11.4% under the **Dwelling-led (425 dpa)** scenario. This range of population growth equates to an estimated housing requirement of -74 to +424 dpa.

3.8 The **WG-2014** scenario results in a low growth outcome compared to the **WG-2018** (and its variants), despite the introduction of dampened assumptions on fertility and mortality in the latter. The recent history of high net in-migration to Pembrokeshire-Out, is the key driver of the higher growth outcomes (Figure 7).

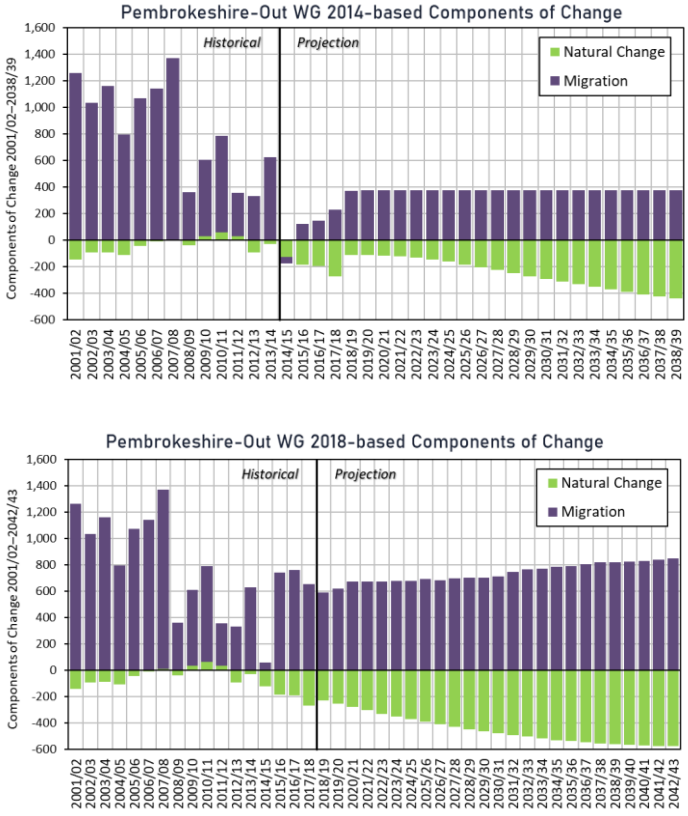


Figure 7: Pembrokeshire-Out – Components of Population Change, WG Principal Scenarios (Source: WG)

3.9 The **Dwelling-led (5yr Average)** and **Dwelling-led (10yr Average)** scenarios, which continue the average rate of past housing growth, result in an estimated population growth of 10.9% and 9.8% respectively by 2033 and an average annual net in-migration to Pembrokeshire-Out of +1,023 and +955 per year.

3.10 The effect of dampened fertility and mortality assumptions upon growth outcomes is evaluated with a variant of the **PG Long Term** scenario, using fertility and mortality assumptions from the **WG-2018 (HIGHPOP)** scenario. The **PG Long Term (Fert-H Mort-H)** scenario results in a 7% increase in the dwelling requirement (317 dpa) from the **PG Long Term** outcome (295 dpa).

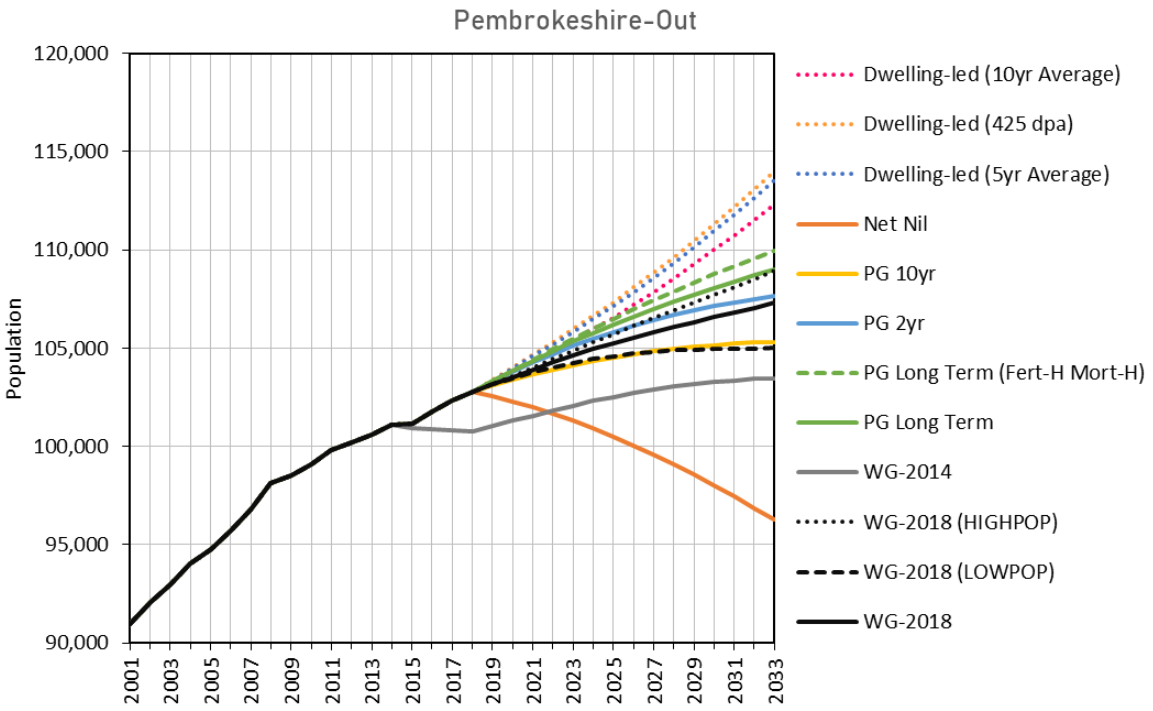


Figure 8: Pembrokeshire-Out - Population Growth 2001–2033

Table 2: Pembrokeshire-Out - Scenario Outcomes 2017–2033

Scenario		Change 2017–2033				Average per year	
		Population Change	Population Change %	Households Change	Households Change %	Net Migration	Dwellings
Dwelling-led	425 dpa	11,630	11.4%	6,229	13.9%	1,047	424
	5yr Av	11,199	10.9%	6,058	13.5%	1,023	412
	10yr Av	9,986	9.8%	5,577	12.4%	955	379
Demographic	PG Long Term (Fert-H Mort-H)	7,630	7.5%	4,662	10.4%	771	317
	PG Long Term	6,681	6.5%	4,342	9.7%	771	295
	WG-2018 (HIGHPOP)	6,615	6.5%	4,607	10.3%	736	313
	PG 2yr	5,313	5.2%	4,309	9.6%	749	293
	WG-2018	4,984	4.9%	3,985	8.9%	688	271
	PG 10yr	2,991	2.9%	2,804	6.2%	556	191
	WG-2018 (LOWPOP)	2,670	2.6%	3,177	7.1%	641	216
	WG-2014	2,655	2.6%	2,709	6.1%	368	184
	Net Nil	-6,053	-5.9%	-1,082	-2.4%	46	-74

Note: Scenarios ranked in order of population growth

Age Profile

3.11 The changing age profile associated with Pembrokeshire-Out's future population growth is an important consideration in planning for housing. The change in population age profile over the 2017–2033 plan period is presented for four scenarios to illustrate the degree to which net in-migration can influence the future age profile of Pembrokeshire-Out (Figure 9).

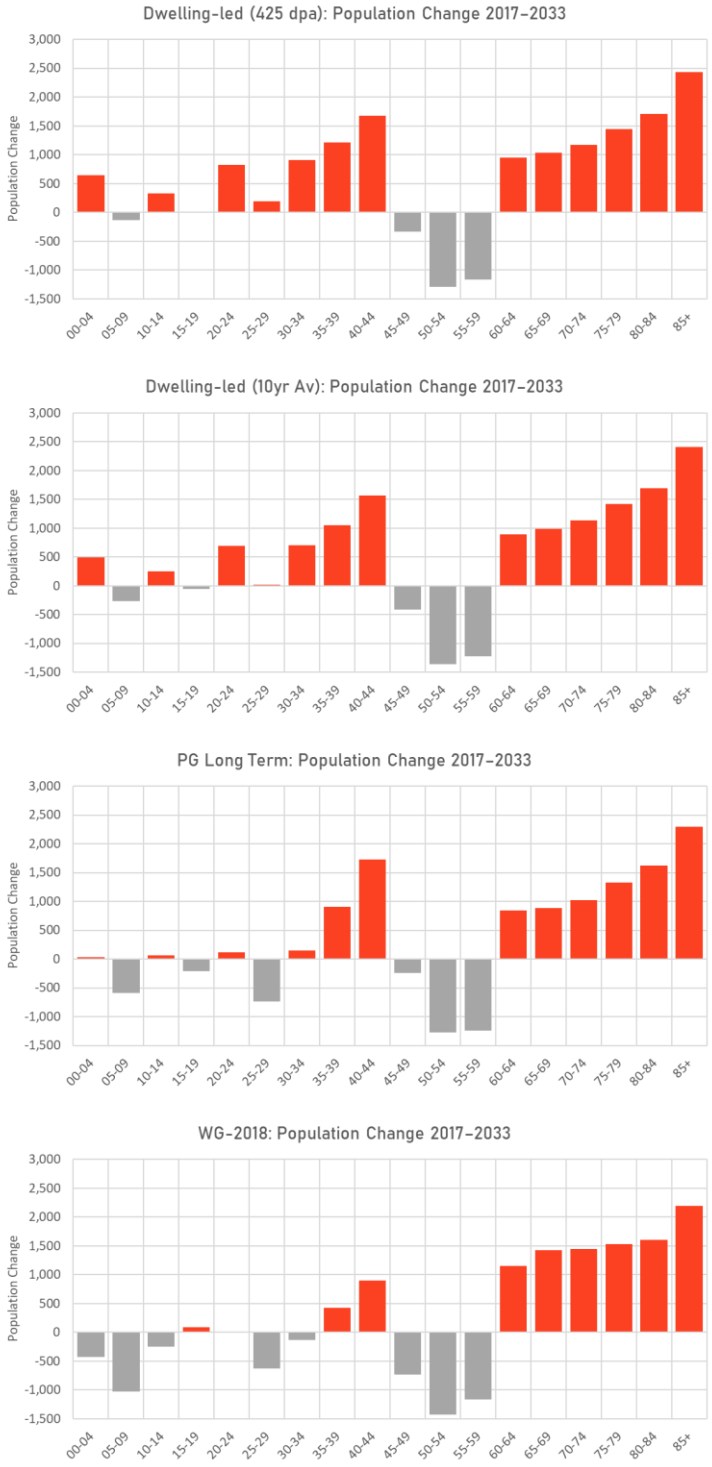


Figure 9: Pembrokeshire-Out – Population Change by Age-Group

3.12 The higher growth **Dwelling-led (425 dpa)** and the **Dwelling-led (10yr Av)** are compared to the **PG Long Term** and **WG-2018** scenarios. Growth in the oldest age-groups is very similar across each scenario, with the key differences evident in the young adult age-groups, 20–44. The high dwelling count of the dwelling-led scenarios drives higher net in-migration of young adults, with a corresponding increase in the 0–14 age range. The higher growth in the younger adult age-groups is particularly important when considering the link between Pembrokeshire-Out's population change and the size and profile of its resident labour force.

Membership Rate Sensitivity

3.13 The WG 2018-based household projection model uses the same membership rate and household size assumptions as the 2014-based model. These differ from the WG's 2008-based household model, which was underpinned by assumptions of higher rates of household formation.

3.14 To evaluate the potential impact of higher household formation on housing growth in Pembrokeshire-Out, each of the demographic scenarios has been configured using membership rate and household size assumptions from the WG 2008-based household projection model.

3.15 Under the demographic scenarios, changes to the household membership rates and household size influence the level of household and dwelling growth required to support the estimated change in population. With the application of the WG's 2008-based assumptions, higher dwelling growth is estimated over the 2017–2033 plan period; approximately 50% higher under some scenarios (Table 3).

Table 3: Pembrokeshire-Out - Membership Rate Sensitivity Scenario Outcomes 2017–2033

Scenario	2017–2033			
	Population Change	Population Change %	Average Annual Dwelling Growth	
			2018-based	2008-based
PG Long Term (Fert-H Mort-H)	7,630	7.5%	317	454
WG-2018 (HIGHPOP)	6,615	6.5%	313	442
PG Long Term	6,681	6.5%	295	431
PG 2yr	5,313	5.2%	293	415
WG-2018	4,984	4.9%	271	396
WG-2018 (LOWPOP)	2,670	2.6%	216	335
PG 10yr	2,991	2.9%	191	312
WG-2014	2,655	2.6%	184	302
Net Nil	-6,053	-5.9%	-74	14

Note: Scenarios ranked in order of dwelling growth

4 Summary

Growth Outcomes

4.1 Pembrokeshire Council is in the process of updating its LDP. As part of it, the Council has sought to collate the latest demographic evidence to inform its housing growth options. Pembrokeshire-Out's recent profile of population growth has been characterised by relatively high net in-migration, so even with the introduction of dampened assumptions on fertility and mortality in the latest round of WG projections, its growth outlook is positive relative to the WG's 2014-based evidence.

4.2 POPGROUP technology has been used to configure a suite of growth scenarios for Pembrokeshire-Out. Under each scenario, population, household, migration and dwelling growth is presented over a 2017–2033 plan period.

4.3 Under each scenario, household growth has been estimated using household membership rate and size assumptions from the WG's 2018-based household projection model, in combination with a dwelling vacancy rate of 8.1%.

4.4 Over the 2017–2033 plan period, population change of -5.9% to 11.4% is estimated under the range of scenarios, with a corresponding household growth of -2.4% to 13.9%. The associated average annual dwelling growth ranges from -74 to +424 dpa.

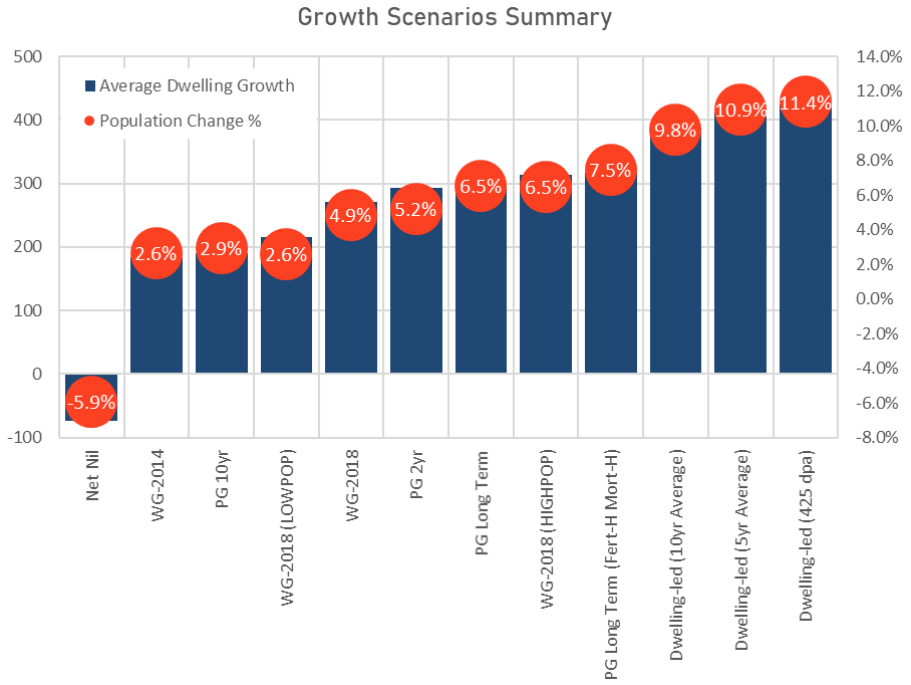


Figure 10: Pembrokeshire-Out - Growth Scenarios Summary 2017-2033

LDP Development and COVID-19

4.5 The updated growth scenarios, presented as evidence to inform the replacement LDP for Pembrokeshire-Out, have been formulated at a time of extraordinary social and economic upheaval. Following the political turbulence of Brexit, the global COVID-19 pandemic has resulted in an unprecedented interruption to the daily lives of all UK citizens.

4.6 The latest round of WG population projections has introduced a dampened outlook for fertility and mortality, with the recovery from COVID-19 likely to confirm this, at least in the short-term. At the same time, the future impact of international migration is highly uncertain due both to the COVID-19 impact and the impending introduction of the UK's new points-based system for immigration control.

4.7 The UK government has implemented unprecedented labour market interventions in an effort to mitigate the worst effects of the crisis, protecting incomes and providing a platform for economic recovery. But UK GDP is forecast to decline substantially during 2020, with the last two quarters of negative growth placing the country officially 'in recession'.

4.8 Whatever the trajectory of exit from the COVID-19 pandemic, economic recovery will not be uniform across industry sectors and across geographical areas. Food service, retail, hotels, transport and the construction industry have been particularly badly affected. In line with previous economic recessions, it is likely that people on lower wages are going to be hardest hit by the economic impacts of a COVID-19-induced recession, with longer-lasting impacts upon economic inequalities and the geographical concentrations of income deprivation.

4.9 For Pembrokeshire, a greater demand for its residential properties may be an outcome of the pandemic, an escape from cities and towns where the daily commute is no longer a necessity. There is evidence of an increase in rural property sales since the first COVID-19 lockdown began in March 2020. Whether this is a trend that continues remains uncertain. Whilst working-from-home is set to become a key feature of the workplace, the wider economic effects of the pandemic will be a key determinant of future population mobility.

4.10 Planning for the future development of housing, presents a real challenge. The gradual easing of the COVID-19 social restrictions will see businesses and communities adapting to different rules and guidelines for all aspects of daily life, including workplace activities, retailing, travel, education, healthcare, and leisure activities. The housing industry will be a critical component of the economic bounce-back and a key driver of the future growth and distribution of population.

4.11 The Minister for Housing and Local Government has emphasised that the planning system remains at the heart of shaping Wales' future, ensuring that the principles of sustainable development are not sacrificed in the pursuit of economic recovery at any cost[2]. The forthcoming completion of the postponed new National Development Framework (NDF) remains critical to framing regional development in Wales, post-pandemic, and Planning Policy Wales (PPW 10) provides the guiding principles and policies to help drive recovery[3].

[2] Letter from Julie James, Minister for Housing and Local Government to Local Authority Leaders and Chief Executives, July 7, 2020.
[3] Building Better Places - Placemaking and the COVID-19 recovery, July 2020

4.12 Currently, there is insufficient evidence to inform an assessment of the COVID-19 impact upon long term demographic trends. The latest scenario evidence provides a timely and robust suite of outcomes from which Pembrokeshire County Council can consider its LDP options, reviewed and scrutinised in the light of social, economic and demographic changes that will result from the post-COVID-19 recovery.

Appendix A LDP Plan Period 2021–2033

A.1 The emerging LDP will outline housing growth for the 2021–2033 plan period. The population, household and average annual net migration and dwelling growth over the emerging LDP plan period are presented for each of the scenarios in Table 4.

A.2 Household and dwelling growth under the demographic scenarios has been estimated using the WG 2018-based household projection model assumptions. Under the dwelling-led scenarios, these assumptions have been used to estimate the population growth required to support the defined annual change in dwellings.

Table 4: Pembrokeshire-Out - Scenario Outcomes 2021–2033

Scenario		Change 2021–2033				Average per year		Total Dwelling Growth
		Population Change	Population Change %	Households Change	Households Change %	Net Migration	Dwellings	
Dwelling-led	425 dpa	9,248	8.8%	4,685	10.1%	1,113	425	5,100
	5yr Av	8,903	8.5%	4,549	9.8%	1,089	413	4,951
	10yr Av	7,933	7.6%	4,164	9.0%	1,019	378	4,532
Demographic	PG Long Term (Fert-H Mort-H)	5,546	5.3%	3,243	7.0%	773	294	3,529
	WG-2018 (HIGHPOP)	4,937	4.7%	3,305	7.2%	758	300	3,598
	PG Long Term	4,632	4.4%	2,926	6.3%	773	265	3,185
	WG-2018	3,405	3.3%	2,723	5.9%	700	247	2,963
	PG 2yr	3,372	3.2%	2,844	6.1%	751	258	3,096
	WG-2014	1,905	1.9%	1,875	4.2%	377	170	2,040
	PG 10yr	1,646	1.6%	1,671	3.6%	544	152	1,819
	WG-2018 (LOWPOP)	1,230	1.2%	1,964	4.3%	643	178	2,138
	Net Nil	-5,716	-5.6%	-1,476	-3.3%	0	-134	-1,606

Appendix B Pembrokeshire UA

B.1 PCNP authority has identified a dwelling growth target of +960 (60 per annum) over their 2015–2031 plan period[4]. Pembrokeshire County Council has requested that the population growth trajectory under each of the scenarios developed in this report is presented for Pembrokeshire UA (i.e. including PCNP). This includes the population growth trajectory estimated for Pembrokeshire-Out in addition to the population required to support an annual dwelling growth of 60 dpa in PCNP.

B.2 Figure 11 illustrates the population growth trajectories under each of the scenarios for Pembrokeshire UA. Summary statistics on population, household, net migration and dwelling growth are presented in Table 5 (2017–2033) and Table 6 (2021–2033).

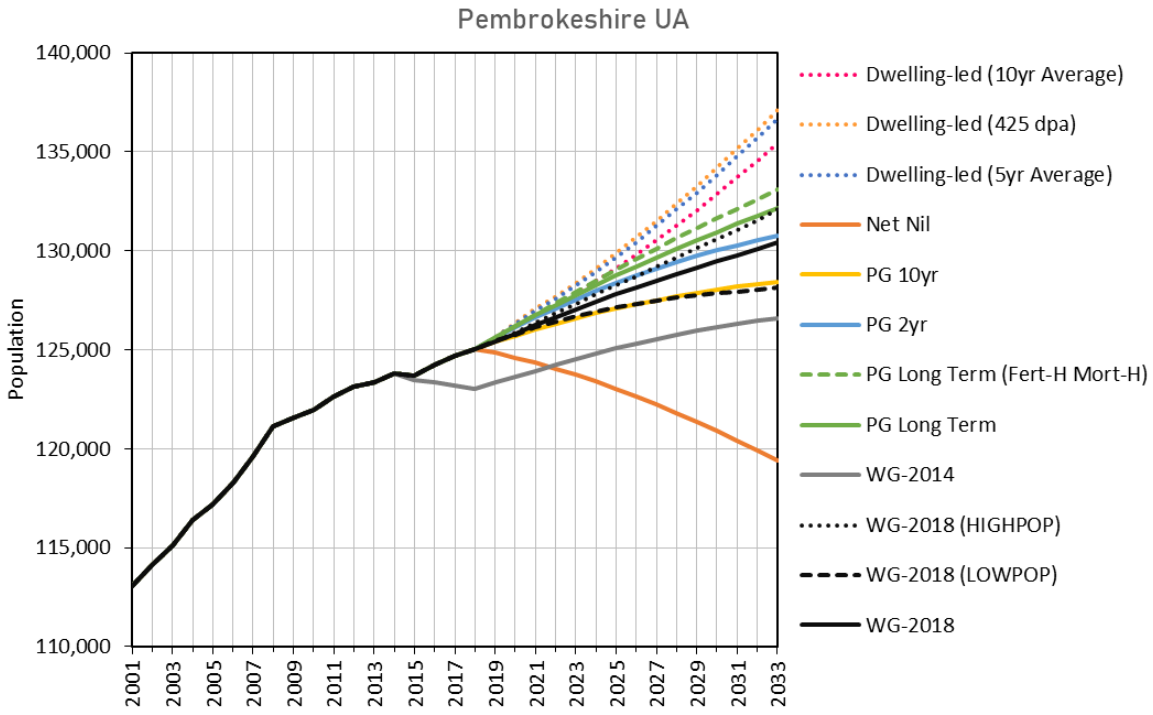


Figure 11: Pembrokeshire UA – Population Growth 2001–2033

[4] https://www.pembrokeshirecoast.wales/planning/planning-policy/local-development-plan-2/

Table 5: Pembrokeshire UA – Scenario Outcomes 2017–2033

Scenario		Change 2017–2033				Average per year		Total Dwelling Growth
		Population Change	Population Change %	Households Change	Households Change %	Net Migration	Dwellings	
Dwelling-led	425 dpa	12,381	9.9%	6,862	12.4%	1,267	478	7,644
	5yr Av	11,950	9.6%	6,691	12.1%	1,243	466	7,458
	10yr Av	10,736	8.6%	6,210	11.2%	1,175	433	6,935
Demographic	PG Long Term (Fert-H Mort-H)	8,381	6.7%	5,295	9.6%	991	371	5,939
	PG Long Term	7,431	6.0%	4,976	9.0%	991	349	5,591
	WG-2018 (HIGHPOP)	7,366	5.9%	5,241	9.5%	956	367	5,880
	PG 2yr	6,064	4.9%	4,942	8.9%	969	347	5,555
	WG-2018	5,735	4.6%	4,618	8.4%	908	325	5,202
	PG 10yr	3,741	3.0%	3,437	6.2%	776	245	3,917
	WG-2018 (LOWPOP)	3,421	2.7%	3,810	6.9%	861	270	4,322
	WG-2014	3,406	2.8%	3,342	6.1%	588	238	3,813
	Net Nil	-5,303	-4.3%	-449	-0.8%	266	-20	-313

Table 6: Pembrokeshire UA – Scenario Outcomes 2021–2033

Scenario		Change 2021–2033				Average per year		Total Dwelling Growth
		Population Change	Population Change %	Households Change	Households Change %	Net Migration	Dwellings	
Dwelling-led	425 dpa	10,023	7.9%	5,213	9.2%	1,358	485	5,820
	5yr Av	9,678	7.6%	5,076	8.9%	1,333	473	5,671
	10yr Av	8,708	6.9%	4,691	8.3%	1,263	438	5,252
Demographic	PG Long Term (Fert-H Mort-H)	6,321	5.0%	3,770	6.6%	1,018	354	4,249
	WG-2018 (HIGHPOP)	5,711	4.5%	3,833	6.8%	1,003	360	4,318
	PG Long Term	5,407	4.3%	3,453	6.1%	1,018	325	3,905
	WG-2018	4,180	3.3%	3,250	5.7%	944	307	3,683
	PG 2yr	4,146	3.3%	3,372	5.9%	995	318	3,816
	WG-2014	2,679	2.2%	2,402	4.3%	622	230	2,760
	PG 10yr	2,421	1.9%	2,199	3.9%	789	212	2,539
	WG-2018 (LOWPOP)	2,004	1.6%	2,492	4.4%	887	238	2,858
	Net Nil	-4,941	-4.0%	-948	-1.7%	245	-74	-886

Appendix C
Pembrokeshire UA Migration Flows

C.1 This Appendix provides a summary of historical internal migration flows between Pembrokeshire and the rest of the UK. As this information is not available at sub-county level, the data refers to Pembrokeshire UA as a whole and not just Pembrokeshire-Out.

C.2 Since 2001/02, with the exception of two years (2008/09 and 2014/15), Pembrokeshire UA has experienced overall positive impact of internal migration, with more people moving into the area than leaving (Figure 12).

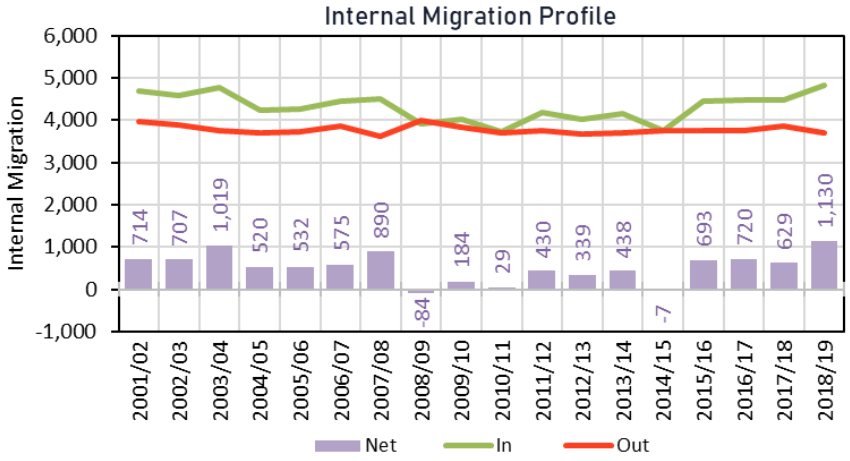


Figure 12: Pembrokeshire UA - Internal Migration Profile 2001/02–2018/19 (Source: ONS)

C.3 When looking at specific direction of flows, Ceredigion emerges as the area contributing the greatest average annual net inflow into Pembrokeshire UA at +25 per annum over the 2001/02–2018/19 period, followed by Caerphilly, Birmingham and Powys. In terms of the largest net outflow, Cardiff is the top destination, with, on average, 67 more people moving from Pembrokeshire UA to Cardiff than leaving Cardiff for Pembrokeshire UA (Figure 13).

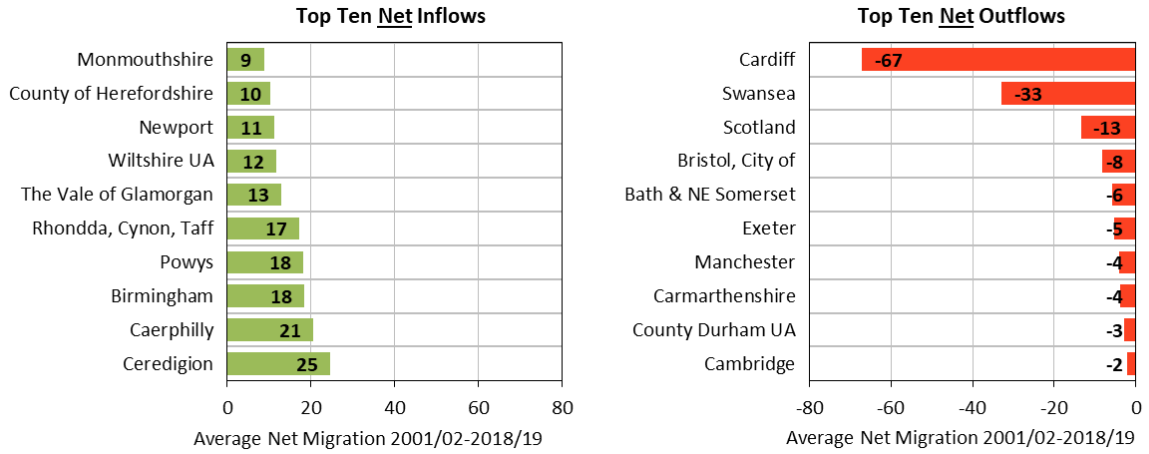


Figure 13: Pembrokeshire UA - Top 10 Net Internal Migration Flows 2001/02–2018/19

C.4 Considering all inflows and outflows rather than the overall net impact, reveals close links between Pembrokeshire UA and the following five Welsh authorities: Carmarthenshire, Cardiff, Ceredigion, Swansea and Rhondda, Cynon, Taff (Figure 14).

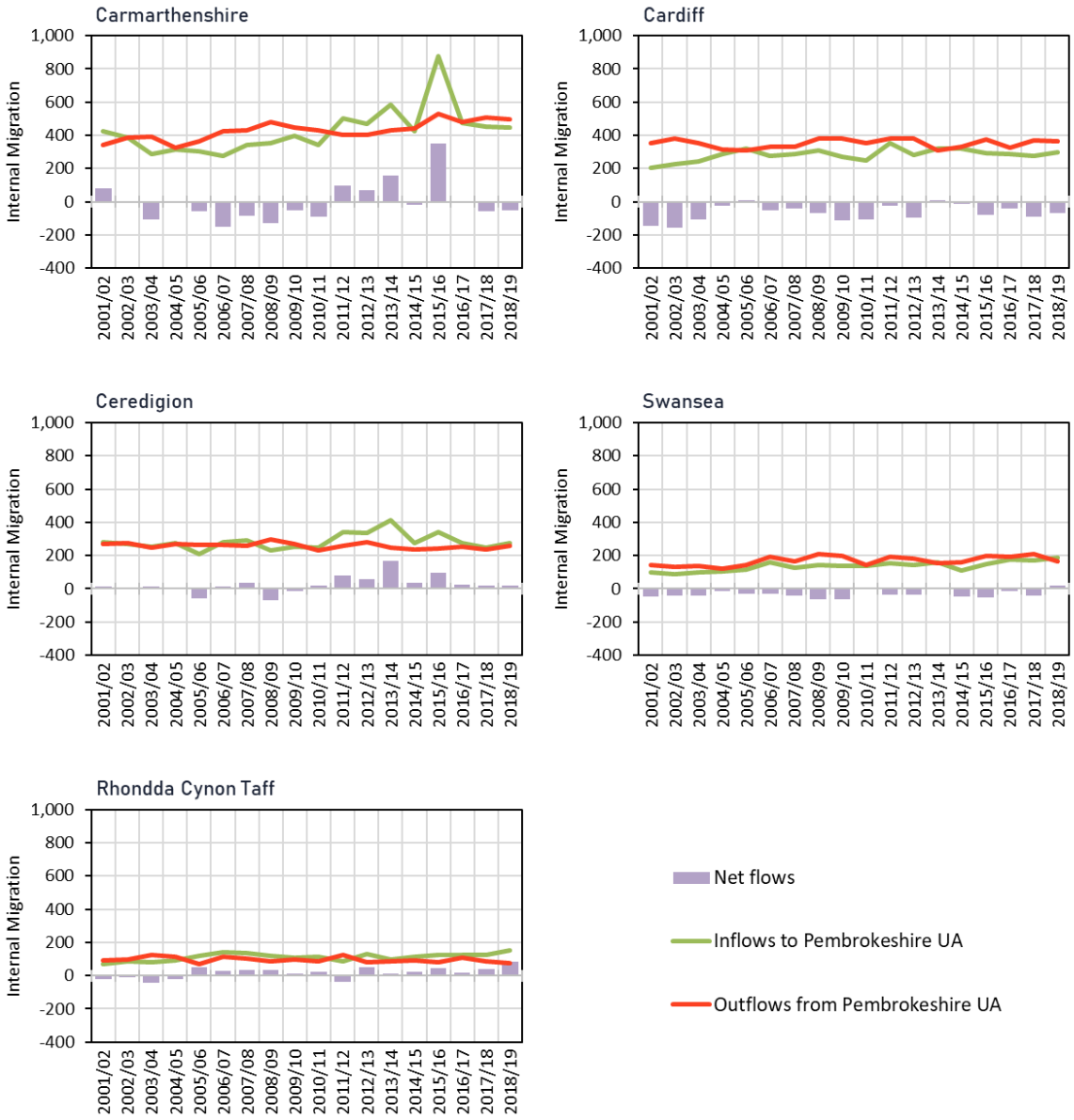
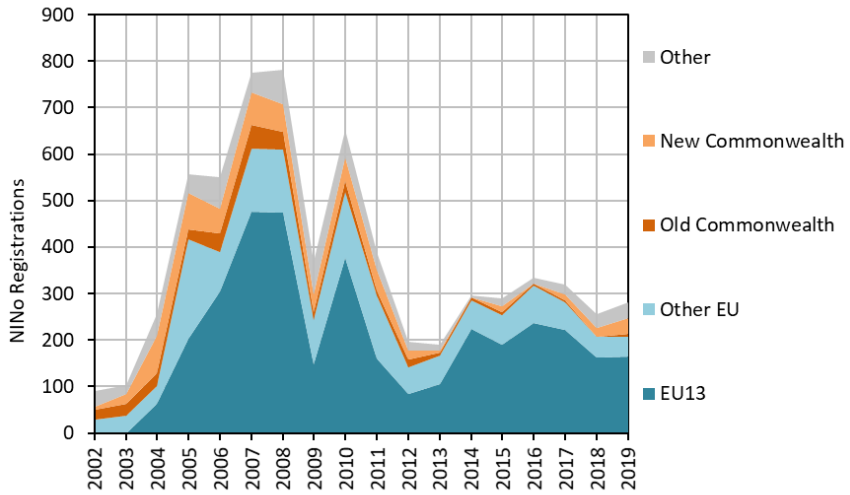


Figure 14: Migration Flows Between Pembrokeshire UA and Other Welsh Authorities 2001/02–2018/19 (Source: ONS)

C.5 The highest inflows and outflows are between Pembrokeshire UA and Carmarthenshire, averaging +425 and -429 per year respectively; and resulting in a relatively small net flow of -4 per year over the 2001/02–2018/19 time period.

C.6 National Insurance Number (NINo) registrations provide an indication of the number of foreign nationals that have registered to work in Pembrokeshire UA since 2002 (Figure 15). Historically, migrant workers from Poland have represented a large proportion of total NINo registrations (29% of total NINo registration 2002–2019). However since 2012, the number of workers from Poland has fallen, whilst Romanian NINo registrations have increased.

C.7 Whilst total NINo registrations have increased since 2012, they remain notably lower than the peak in 2008 (782 registrations).



Note: EU13 refers to countries that joined the European Union (EU) since 2004. Other EU refers to all other EU countries.

Figure 15: Pembrokeshire UA - NINO Registrations 2002–2019 (Source: DWP)

Appendix D POPGROUP Methodology

D.1 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 16) is a cohort component model, which enables the development of population forecasts based on births, deaths and migration inputs and assumptions.

D.2 The Derived Forecast (DF) model sits alongside the population model (Figure 17) providing an associated model for both household and labour-force projections and the basis for the dwelling-led and employment-led scenario options.

D.3 For further information on POPGROUP, please refer to the Edge Analytics website: www.edgeanalytics.co.uk.

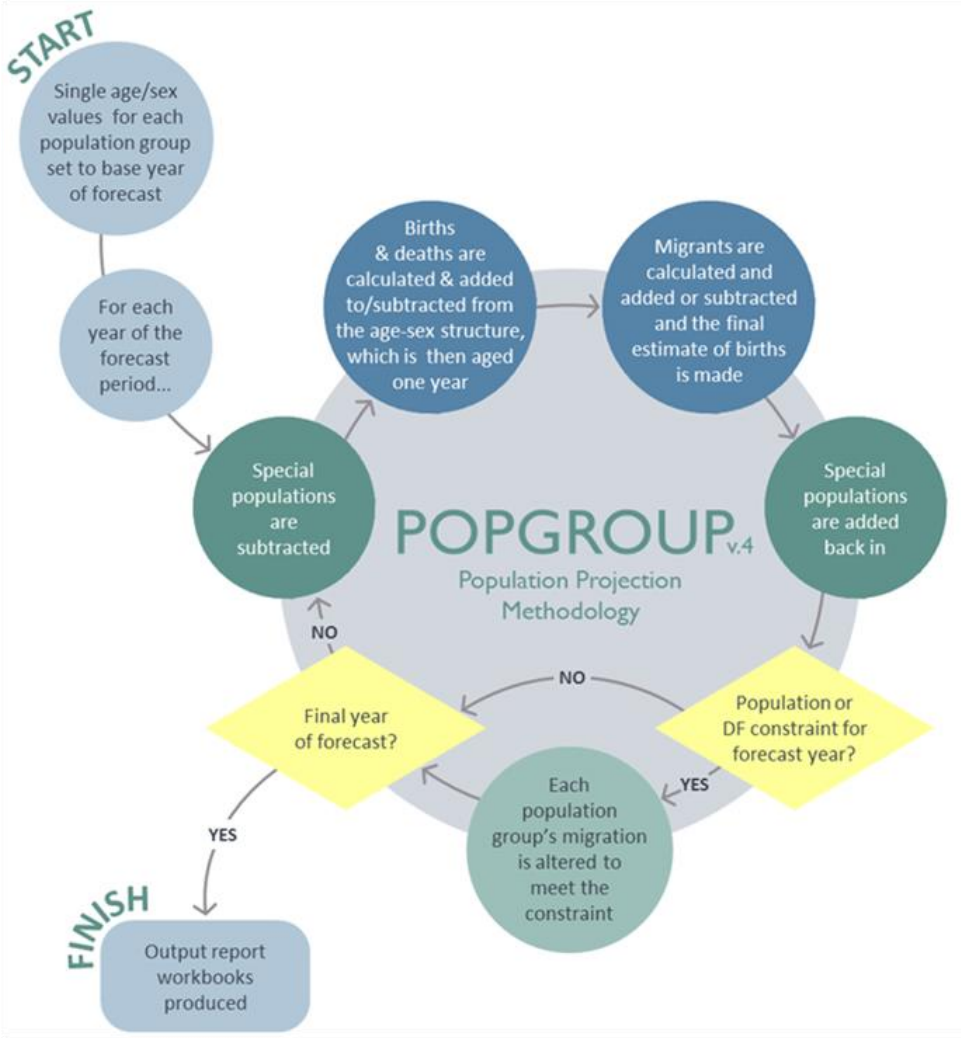
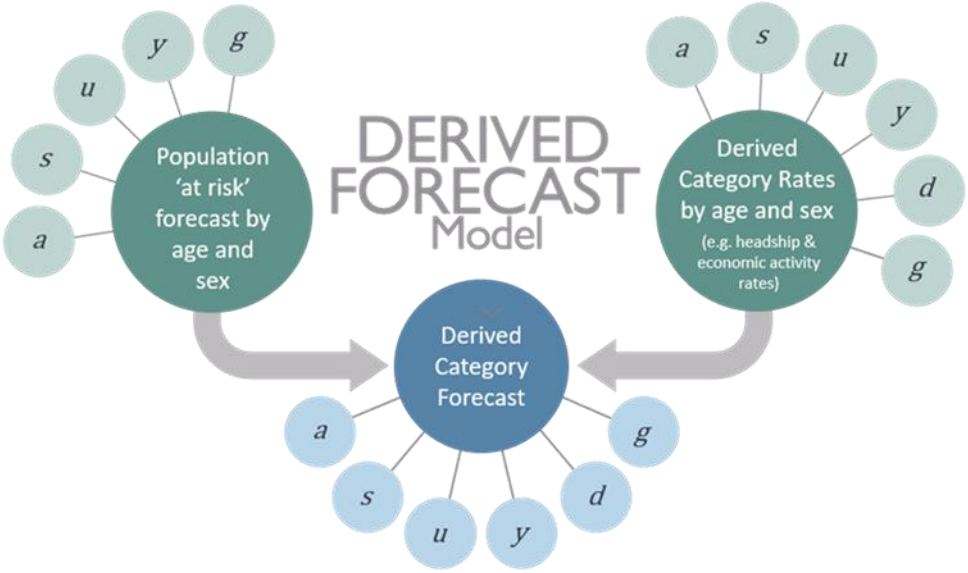


Figure 16: POPGROUP Population Projection Methodology



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

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

Figure 17: Derived Forecast (DF) methodology

Appendix E Data Inputs & Assumptions

Population

E.1 In each scenario, historical population statistics are provided by ONS mid-year population estimates (MYE), with all data disaggregated by five-year age and sex. The WG scenarios use MYE populations up until their respective 2014 and 2018 base years. Each of the PG and Dwelling-led scenarios uses an ONS 2018 MYE as its base year.

Births & Fertility

E.2 In each scenario, historical mid-year to mid-year counts of births by sex have been sourced from the ONS MYEs, aggregated and apportioned from Census Output Area geographies. Under the WG scenarios, historical births counts have been used until each scenario's base year.

E.3 For the Dwelling-led and PG scenarios, birth counts are used from 2001/02 to 2017/18. From 2018/19, in combination with the 'population-at-risk' (i.e. all women between the ages of 15–49), the following assumptions provide the basis for the calculation of births in each year of the forecast period:

- A district-level age-specific fertility rate schedule (derived from the WG 2018-based SNPP).
- A fertility differential for the Pembrokeshire-Out sub-district area, derived from historical births data.
- Long term assumptions on changes in ASFRs from the WG 2018-based SNPP for the district.

E.4 In each of the WG scenarios, the future *counts* of births are specified from their base year onwards to ensure consistency with the respective population growth outcomes.

Deaths & Mortality

E.5 In each scenario, historical mid-year to mid-year counts of deaths have been sourced from the ONS MYEs. Under the WG scenarios, historical deaths counts have been used until each scenario's base year.

E.6 For the Dwelling-led and PG scenarios, death totals are used from 2001/02 to 2017/18. From 2018/19, in combination with the 'population-at-risk' (i.e. the total population of the study area), the following assumptions provide the basis for the calculation of deaths in each year of the forecast period.

- A district-level age-specific mortality rate (ASMR) schedule, measuring the expected mortality rates by age and sex (derived from the WG 2018-based SNPP).
- A fertility differential for the Pembrokeshire-Out sub-district area, derived from historical deaths data.

- Long term assumptions on changes in ASFRs from the WG 2018-based SNPP for the district.

E.7 In each of the WG scenarios, the future counts of deaths are specified from their base year onwards to ensure consistency with the respective population growth outcomes.

Migration

E.8 Other than Census statistics, there are no historical migration statistics available at a sub-district level. Therefore, migration is calculated as the 'residual' of the population after taking account of births and deaths. 'Net migration' equates to the cumulative impact of the four types of migration modelled within POPGROUP (in-migration, out-migration, immigration and emigration).

E.9 Using the Census statistics, historical estimates of migration are derived for the study area. This is achieved by comparing the migration implied by the schedule of rates for all areas (in this case, the schedule from the WG 2018-based SNPP for the district of Pembrokeshire) with the pattern of migration observed for wards in the Census statistics.

E.10 Once the historical estimates have been derived, under the **Dwelling-led** and **PG Long Term** scenarios a weighted average of the last seventeen years of estimated migrant counts (2001/02–2017/18) is used directly as input to scenario forecasts. For the **PG 10yr** and **PG 2yr** scenarios, this weighted average is calculated from the last 10 years (2008/09–2017/18) and the last 2 years (2016/17–2017/18) of evidence, respectively.

Households & Dwellings

E.11 A household is defined 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*". A dwelling is defined as a unit of accommodation which can either be occupied by one household or vacant.

E.12 Apart from the **Dwelling-led** scenario, the household and dwelling implications of each population growth trajectory have been estimated through the application of household membership rates, communal population statistics and a dwelling vacancy rate. These assumptions have been sourced from the 2011 Census and the WG's 2018-based household projection model. In the **Dwelling-led** scenarios, these assumptions are used to determine the level of population growth required by the defined dwelling growth trajectory.

Membership Rates

E.13 The membership rates are used to calculate the proportion of the household population in each household category by age group and sex (Table 7), taken from the WG household model. The household population is converted into households using average household size assumptions, taken from the household model.

Household Category
1 person
2 person (No children)
2 person (1 adult, 1 child)
3 person (No children)
3 person (2 adults, 1 child)
3 person (1 adult, 2 children)
4 person (No children)
4 person (2+ adults, 1+ children)
4 person (1 adult, 3 children)
5+ person (No children)
5+ person (2+ adults, 1+ children)
5+ person (1 adult, 4+ children)

Table 7: WG Household Categories (Source: WG)

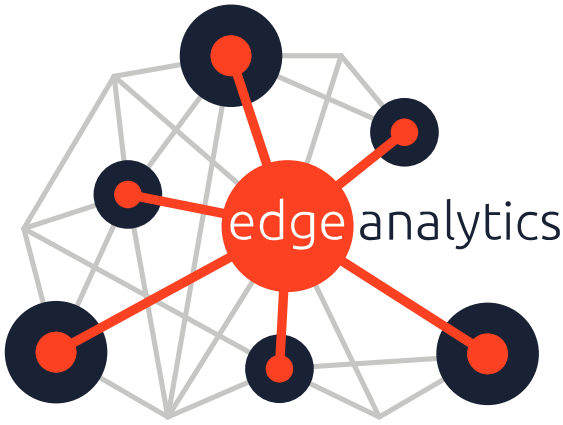
Communal Population Statistics

E.14 Household projections in POPGROUP exclude the population 'not-in-households' (i.e. the communal/institutional population). These data are drawn from the WG household projection. Examples of communal establishments include prisons, residential care homes and student halls of residence.

E.15 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 population not-in-households varies across the forecast period depending on the size of the population.

Vacancy Rate

E.16 The relationship between households and dwellings is modelled using a 'vacancy rate', derived from the 2011 Census using statistics on households (occupied household spaces) and dwellings (shared and unshared). A vacancy rate of 8.1% for Pembrokeshire-Out has been applied and fixed throughout the forecast period. Using the vacancy rate, the 'dwelling requirement' of each household growth trajectory has been evaluated.



Edge Analytics Ltd
Nexus | Discovery Way | University of Leeds | Leeds | LS2 3AA
www.edgeanalytics.co.uk