

Update 2018-04

Experimental Employment-led Projections

Technical note

July 2018

Introduction

The 2016-based GLA employment-led population projections provide population trajectories consistent with past demographic trends and projected employment growth.

The populations are tied to GLA Economics assumptions of future GVA growth and labour demand (workforce jobs) under three core scenarios: low, central and high. The model reconciles population with available jobs through assumptions about future rates of unemployment. The population itself is varied by changes to the level of international in-migration.

The populations defined by the low and high employment scenarios indicate a range within which population might be expected to fall given the model assumptions. They are intended to assist stakeholders and policy makers in understanding how London's population might evolve over the coming decades during a period of economic uncertainty.

Note: The employment-led population projections methodology and associated outputs are experimental. All modelling exercises are defined by the assumptions on which they are based. The projections presented here outline populations which are consistent with labour supply under the particular scenarios and conditions described below.

Demographic Projections

GLA demography produce a range of demographic projections which are used to help inform planning and policy work within the GLA and across London. These projections are updated annually incorporating the latest data as it becomes available. The latest set of demographic projections are the 2016-based projections¹ which include trend-based, housing-led, ethnic group, and small area projections.

Among these outputs, the *central trend projection* provides the GLA's principal scenario of regional level population to inform strategic planning. This projection incorporates ten years of past migration data on which to calculate future migration rates, in contrast to the shorter periods used to inform ONS's Subnational Population Projections. This approach ensures that the range of migration behaviour observed through various stages of an economic cycle are captured and projected.

¹ <https://data.london.gov.uk/demography/>

Employment Projections

GLA Economics regularly publishes an update of its labour market projections of workforce jobs in London². The most recent set of projections are the 2017 round³ with a projection horizon of 2050. The projections incorporate judgements about trend productivity growth – that is the trend in the ratio of output, or GVA, and jobs. There are three core employment projection scenarios⁴ that reflect alternative assumptions about future economic growth: the central, high, and low scenarios⁵.

The three employment projection scenarios⁶ have associated assumptions of GVA growth:

- the central scenario assumes medium-term growth of 2.5% a year over 2016-18, tapering exponentially over the longer term to 2.0%
- the high scenario has growth of 3% a year in the medium-term falling off to 2.5% a year in the long term.
- the low scenario has lower overall GVA growth of 2.5% a year in the medium-term, and 1.5% a year in the longer term

This range of GVA growth encompasses a range of possible future economic growth scenarios and policy outcomes.

In the central scenario the projections estimate that London will grow by an annual average rate of 0.78 per cent, equivalent to 49,000 jobs per annum, to reach 6.91 million jobs in 2041.

Figure 1 shows the actual (2000-2016) and projected (2017-2050) total workforce jobs in London for the three employment projection scenarios. At 2041 the central scenario projects 6.91 million jobs, the high scenario projects 7.80 million jobs, and the low scenario projects 6.32 million jobs.

² <https://data.london.gov.uk/dataset/long-term-labour-market-projections>

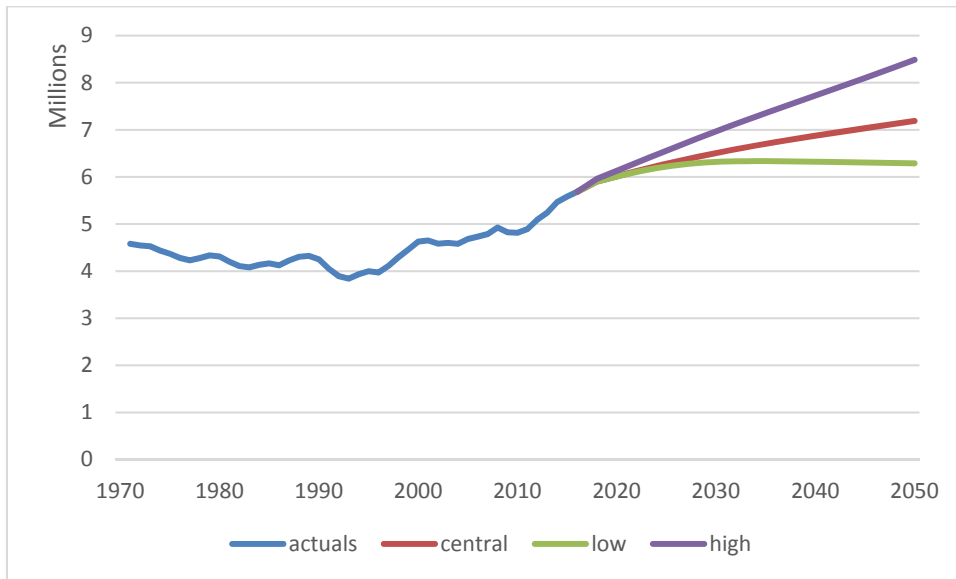
³ London Labour Market Projections 2017 (August 2017)

⁴ In addition to the core scenarios, GLA Economics publish projections with an alternative 'jumping-off' point and forecasts which hold the future employment rate constant. This approach encompasses a broad range of potential scenarios and reflects the uncertainty inherent in projection modelling.

⁵ <https://files.datapress.com/london/dataset/long-term-labour-market-projections/2018-03-16T12:25:50.86/London%20all%20scenarios%20no%20links%20for%20datastore%20final.xlsx>

⁶ <https://files.datapress.com/london/dataset/long-term-labour-market-projections/2018-03-16T12:25:50.86/London%20all%20scenarios%20no%20links%20for%20datastore%20final.xlsx>

Figure 1: Total workforce jobs, London



Source: 2017 Employment projections, GLA Economics

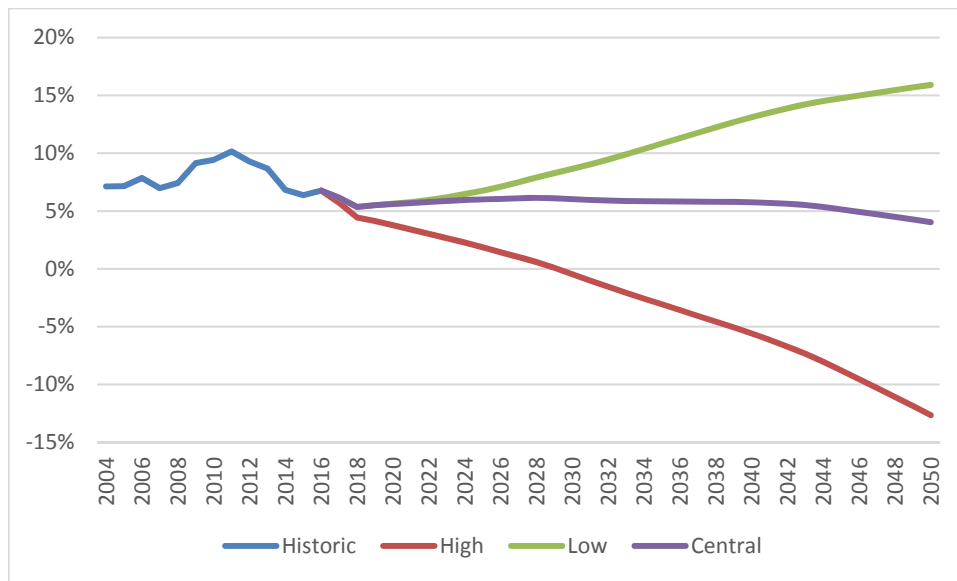
Reconciling workforce jobs and population

The central jobs scenario is calibrated against the GLA central trend population projection. This process incorporates assumptions about current and future levels of in- and out-commuting, and unemployment to balance labour supply (population) with labour demand (jobs). In this way the central trend population projection provides a sense check of the central jobs scenario.

NOTE: The levels and rates of unemployment which result from this balancing process are not intended as unemployment forecasts. They simply provide a sense check of the validity of the modelling assumptions. There is a range of values and rates of unemployment which would be acceptable under this process and the path implied by reconciling the central trend population with the central jobs projection is just one of these.

However, it is not meaningful conceptually to calibrate the high and low scenarios against the central trend population projection, nor is it meaningful in practice. The range between the high and low jobs projections is such that using the central trend population in these scenarios produces infeasible levels of unemployment. Figure 2 shows the change in the implied unemployment rate for the three scenarios. In the high scenario the rate immediately falls below five per cent level and by 2030 falls below zero meaning an implied negative unemployment. In the low scenario unemployment rises quickly after 2022 and by 2034 exceeds 10 per cent, reaching 15.9 per cent by the end of the projection.

Figure 2: Implied unemployment rate (16-64), 3 employment projections scenarios



Source: 2016-based population projections, GLA demography; 2017 Employment projections, GLA Economics

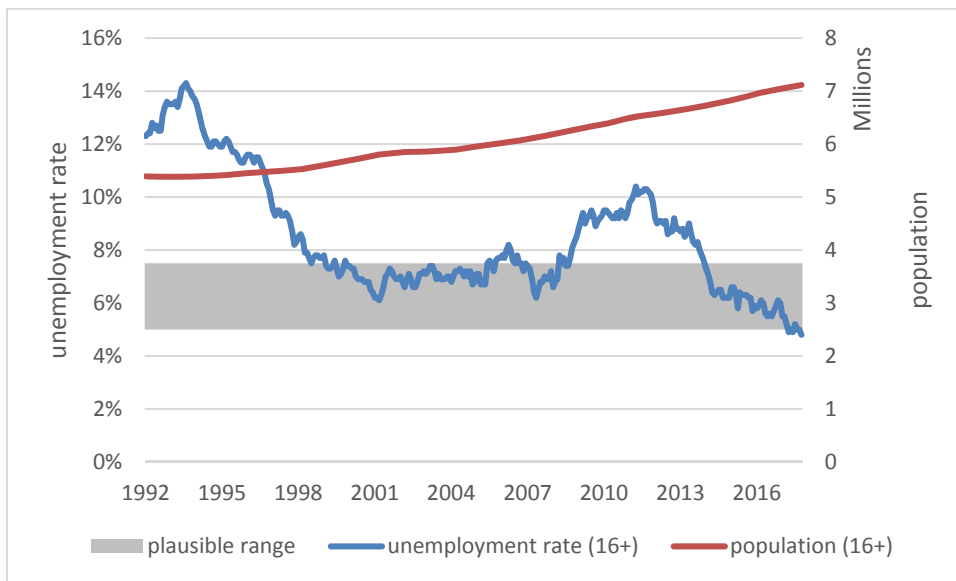
Note: Figure 2 is not an unemployment forecast. The central trajectory is used to provide a sense check of the modelling assumptions.

The central trend population is therefore inconsistent with the high and low employment projection scenarios and must be revised for these two scenarios to achieve a level that is consistent with the supply of jobs. The employment-led population projection model achieves this by assuming an unemployment rate for each year of the projection and then calculating a population which is consistent with that assumption and the projected supply of jobs.

Unemployment

The rate of unemployment in London over the past 25 years has fluctuated significantly. Figure 3 charts the employment rate against the population (both aged 16 and over). The peaks in the rate in the early 1990s and early 2010s result from the economic downturns and recessions seen during those periods. Conversely the population trajectory over the period shows constant and consistent growth. There appears to be no direct relationship between the rate of unemployment and the growth in population in London. This is because the growth in population has been matched by growth in labour demand meaning the unemployment rate has remained low, and affected by other factors such as the economic cycle.

Figure 3: Unemployment rate and population, age 16+, London, 1992-2018



Source: *Regional labour market statistics (LFS), April 2018, ONS*

What can be identified from the historical unemployment rates series is a range of reasonable values within which London's future unemployment rate might be expected to lie. The mean rate over the period 1992-2018 was 8.48 per cent. However, this mean includes the peaks associated with the two recessions (1990 & 2010). A range between 5 per cent and 7.5 per cent (grey band in Figure 3) includes half of all the data points since 1992 and the majority of data points not associated with the extremes of recession.

In the central jobs scenario, the unemployment rate for the projection period remains within the range 5-7.5 per cent (with the exception of the final five years where it falls slightly below 5 per cent). The average unemployment rate over the whole projection period 2017-2050 is 5.64 per cent. This can therefore be considered a plausible future unemployment range within the context of past trends and future uncertainty. However, it is important to note that many other plausible ranges for future unemployment would also be valid within these defined parameters. The estimated unemployment rate helps provide a sense check of the consistency of the employment and population projections. It should not be considered a projection because there are other factors which have a bearing on the unemployment rate, and which have not been modelled.

Employment-led methodology overview

The relationship between population and employment is complex, especially in a global city such as London where both national and international factors can affect population trends and employment demand. In order to project interactions over time the model outlined here makes a number of assumptions and necessary simplifications. The model outputs are consistent with these assumptions but under other conditions different result may be achieved.

Central to the methodology employed here is the idea that unemployment is the mechanism through which population and jobs are balanced. GLA Economics adopts a modelling structure, and assumptions for commuter flows and economic activity rates, to convert estimates of jobs in London to London residents with jobs. These are linked to population projections to provide estimates of employment and unemployment rates.

The model proposed here uses the unemployment rate path determined by reconciling the central population projection with the central jobs projection. For the low and high jobs scenarios it then varies the population until that unemployment rate path is achieved. As previously discussed, there is a broad range of unemployment rate paths that might be used, and, as the methodology of the employment projections abstracts from year-on-year movements in the economic cycle, this is a consistency check rather than a forecast of the future path of the unemployment rate. It is natural to take the unemployment rate path derived from the central scenarios for the projections, and the advantage of this approach is that it provides consistency in results across the scenarios for employment and population projections. Also, as noted above this path satisfies the condition that the rate remains within the range 5-7.5 per cent.

In any given year, the population and jobs are balanced using the following equation:

$$u_y = (e \cdot p_y) - l_y^s - o_y^s$$

Where:

u = unemployment rate

y = year

e = economic activity rate

p = population

l = London residents who work in London

o = London residents who work outside London

s = scenario

The model operates by iteratively adjusting the population for each year until the resulting unemployment rate is consistent with the chosen rate.

Population projection methodology

The population is projected using the GLA demography cohort component model. Model operation is as described in the trend model methodology note⁷. Rates of fertility, mortality and migration are calculated from past data. In this case, ten years of migration data are used in order that the employment-led population projections are consistent with the central trend population projection. Accordingly, the initial level of international in-migration is calculated as an average of ten years inflow.

⁷ <https://data.london.gov.uk/dataset/projections-documentation>

The reconciliation with the employment projections occurs via the adjustment of the international in-migration component which affects the total population. From the total population, the working age population is extracted and assumptions for commuter flows and economic activity are applied. The resulting population is compared to the available jobs and an implied unemployment rate is derived. This rate is compared to the rate for that year taken from the central scenario. The total population is iteratively adjusted until the desired unemployment rate is achieved.

The iterative adjustment operates for each year of the projection period:

1. The model produces an initial test population which results in an implied rate of unemployment.
2. The implied unemployment rate is compared to the target unemployment rate.
 - a. In cases where the implied rate is too high the population is reduced by reducing international in-migration.
 - b. In cases where the implied rate is too low the population is increased by increasing international in-migration.
3. The model is re-run using the newly calculated amount of international migration.
4. Steps 2 and 3 are repeated until a population consistent with the available jobs is found.
5. The starting level of international in-migration for the next year in the projection is the level arrived at in stage 4.

The adjustment made in step 2 is a proportional change to international migration applied consistently to every local authority in the model⁸. The impact of that blanket adjustment is then processed through the model, and the other components, to determine the population of London.

Migration assumptions

In reality, a consistent blanket change to international in-migration is not the most likely scenario. In fact, there would be a spatial element to how these economic scenarios interact with patterns of migration. A key driver of this geographic variation being the differing distribution of sectors across the country and the differing impacts on those sectors of future economic growth scenarios. However, with no data on which to base assumptions about the spatial aspects of future migration trends the only option available in the modelling is to apply an adjustment consistently across the country.

This approach also assumes that domestic migration is unaffected in any direct way. The impacts on domestic migration are in the form of a second-order response to changes in the available population as a result of the international in-migration component rather than changes to the rates of domestic migration. Again, in reality the interaction would be more complex and one would expect to see a direct response to changing economic conditions in domestic migration.

⁸ The model projects single-year-of-age populations by sex for all districts in England plus national projections for Wales, Scotland and Northern Ireland

Indicative Results

Population

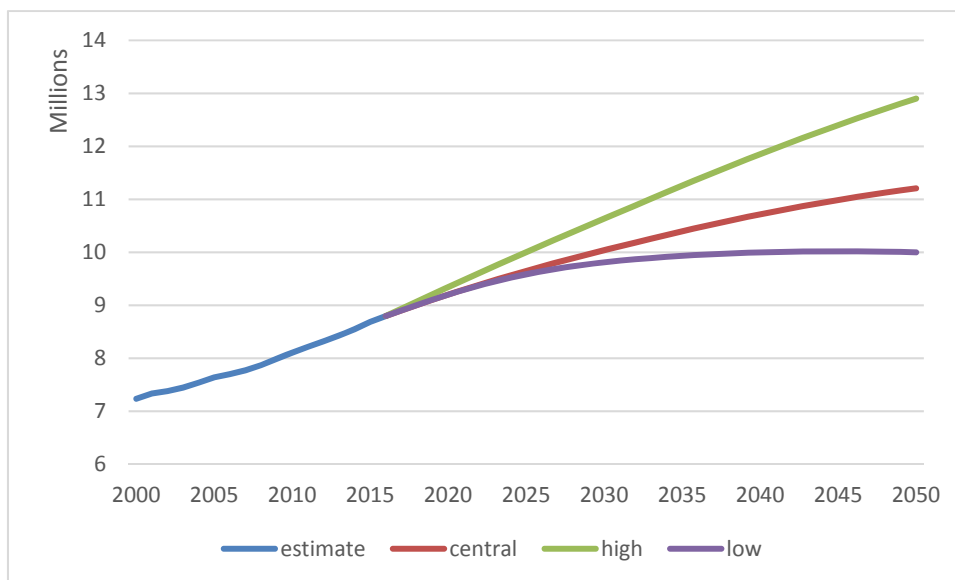
The most recent mid-year population estimate (mid-2016) gave a London population of 8.80 million. Under the central trend projection this is projected to grow by 1.97 million over the period to 2041. The high employment scenario has growth of 3.17 million over the same period while the low scenario has growth of 1.21 million (table 1, figure 4).

Table 1: London population change, 3 scenarios

| | Population 2041 | Growth 2016-2041 | % Growth | Annualised Growth |
|----------------|-----------------|------------------|----------|-------------------|
| Central | 10,776,400 | 1,977,500 | 22% | 79,100 |
| High | 11,968,000 | 3,169,000 | 36% | 126,800 |
| Low | 10,006,800 | 1,207,900 | 14% | 48,300 |

Employment-led population projections, GLA demography

Figure 4: Employment-led population projections (total population), London, 3 scenarios



Source: Employment-led population projections, GLA demography

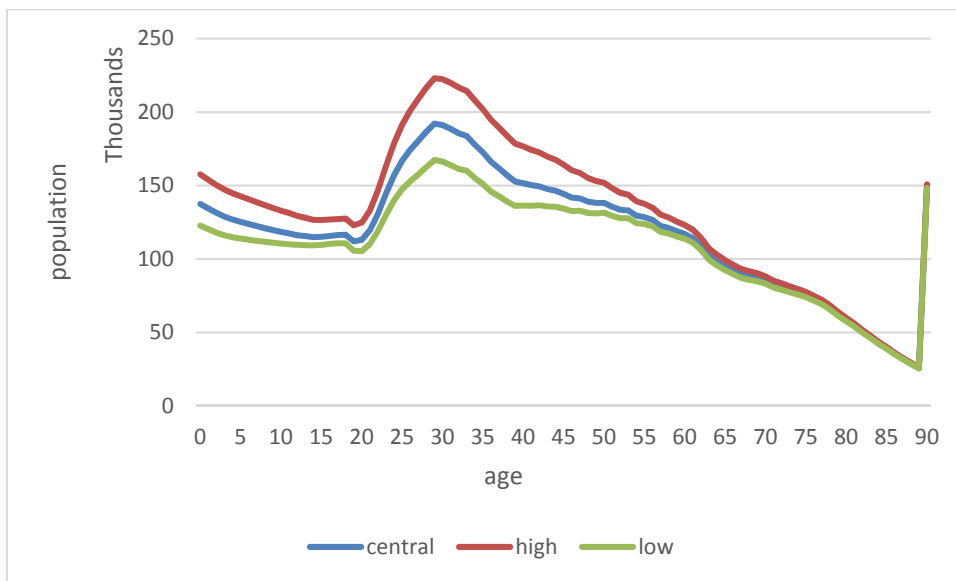
The three scenarios vary not only in terms of total population growth but also in the way the population age structure evolves over the projection period. By 2041 the low variant has fewer individuals among working age (16-64) adults and children (<16). The lower number of children is a secondary impact resulting from a smaller population of females leading to fewer births. The converse can be seen in the high scenario where the extra population required for the labour market is seen in the working age population and there is an associated increase in births. In the older ages (65+) there is much less variation between the three scenarios (table 2, figure 5).

Table 2: London population by age group, 2041

| | Children (<16) | Working Age (16-64) | Elderly (65+) |
|---------|----------------|---------------------|---------------|
| Central | 1,969,000 | 7,041,400 | 1,766,000 |
| High | 2,221,800 | 7,926,200 | 1,820,000 |
| Low | 1,812,800 | 6,458,200 | 1,735,900 |

Employment-led population projections, GLA demography

Figure 5: London population age structure, 2041



Source: Employment-led population projections, GLA demography

Total net migration

In 2016 London saw a net inflow of migrants of 32,800 persons⁹. The central projection projects total net migration falling consistently over the projection and switching from a net inflow to a net outflow by 2026. By 2041 there is projected to be a net outflow from London of 18,000 persons.

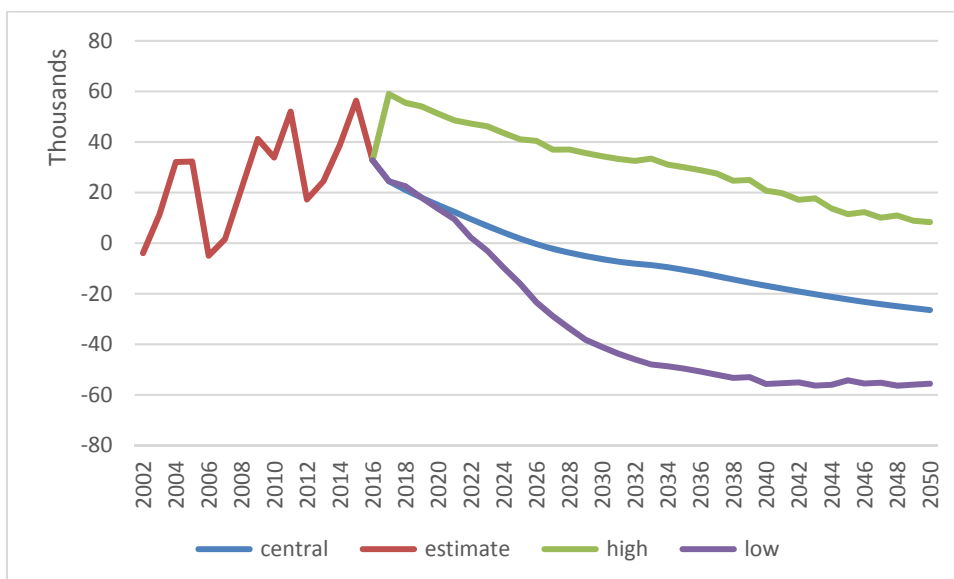
Under the high employment scenario there is naturally significantly more in-migration over the projection period. In the first year of the projection the additional population required to meet jobs demand causes net migration to almost double from 32,000 in 2016 to 59,000 in 2017. Following this initial adjustment period, the projection broadly follows the same trend seen the central projection.

In the high scenario, net migration is always positive, meaning there is an excess of in-migrants over out-migrants. In 2041 total net migration is projected to be an inflow of 19,700 under this scenario.

The low employment scenario has similar levels of migration to the central trend over the initial years of the projection (up to 2021). The excess of population compared with available jobs in the low scenario requires that net migration switch to an outflow sooner than in the central projection – in 2023 rather than 2026. The outflow increases at a much greater rate as well. By 2041 the total net outflow is projected to be 55,300 under this scenario.

Figure 6 shows total net migration under the three scenarios. Negative flows indicate more people leaving London than entering.

Figure 6: Total net migration, London, 3 scenarios



Source: *Employment-led population projections, GLA demography*

⁹ Total net migration = domestic in – domestic out + international in – international out

Summary

The employment-led population projections provide population trajectories which are consistent with projections of jobs growth under three scenarios. The relationship between jobs and population is managed through the imposition of an unemployment rate path consistent with the rate implied in the central population and jobs scenario. This estimated rate (which lies within a plausible range for London's rate of unemployment in the long-term, abstracting from major recessions) is therefore the parameter which ultimately defines the level of population in the low and high population scenarios. The level of population is adjusted through the international in-migration component of population change. This is a necessarily simplified approach to modelling the complex interactions between employment and population.

The outputs of this modelling are not forecasts of population, but rather the high and low scenarios provide a range within which population might be expected to fall under the particular economic conditions described. The purpose of the projections is to provide strategic planners, at the regional level, with some context within which to place the central trend population projection. The projections provide an indication of the range of uncertainty around the central trend projection and are intended to assist planners and policy makers in understanding how London's population might develop in the coming years during a period of political and economic uncertainty.