

Working Paper 39

Borough employment projections to 2031

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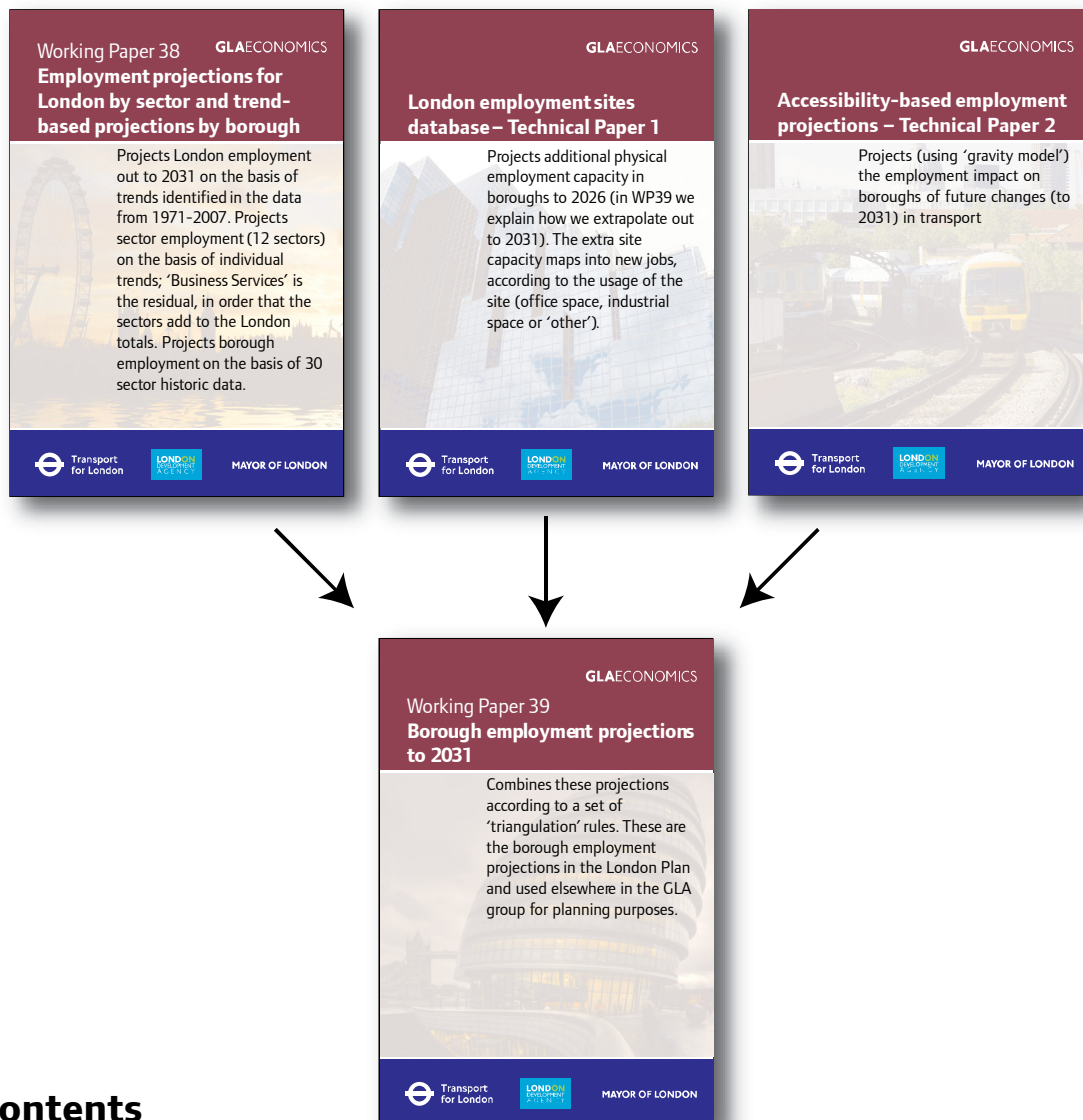
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Working Papers and Technical Papers explaining the calculation of the Greater London Authority's employment projections running to 2031



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Introduction

The calculation of the GLA's medium term employment forecasts was explained in Working Paper 18 (October 2006). To recap, research is conducted by, or on behalf of, GLA Economics into the influence of three key determinants of future employment:

- Historic trends of employment, revealing the preference of employers for locating jobs in particular boroughs and the 'agglomeration' pull of some boroughs for additional jobs (for example, the City for financial services). This research was undertaken with technical assistance from Volterra Consulting (henceforth, Volterra).
- Site capacity – reflecting the expected availability of new business sites for jobs to locate in across London. This research was undertaken by Roger Tym and Partners (henceforth, RTP).
- Accessibility – reflecting the relative 'pull' of the London boroughs, projected by a 'gravity model'¹ reflecting changes in accessibility resulting from scheduled investments in London's transport, by Colin Buchanan and Partners.

It is worth emphasising that 'employment' in this and its companion, Working Paper 38 (WP38), refers to the numbers who work in the specified area ('workplace employment') and not to the numbers who live in that area who have jobs. That is, it includes commuters at their place of work.

Trend-based employment projections

With the assistance of Volterra, we are publishing (together with this paper) WP38 which sets out the GLA's trend-based employment projections.

In WP38 we first take a view on forecast trend output growth and then use the rate of productivity growth in the past to make a projection. This gives a path for employment in London. We then allocate this employment growth by sector (at the 12-sector level), using (for eleven of the twelve sectors) the historic path of employment as a guide to the future. The exception – the 12th sector – is business services. This we forecast as the 'residual' between the sum of the other eleven sectors and the London-wide forecast. The historic behaviour of this sector also makes it opportune to project it by residual. Since 1971 employment in business services per unit of London output has grown on average by 1.1% annually. If we extrapolated this growth, by 2031 we would be looking at some 40 per cent of total London employment in this sector – clearly implausible.

¹ The theory underlying the 'gravity model' is that the easier it is to reach a location and the greater the numbers within journey time from the location, the more development and therefore employment that location will attract.

To forecast employment in each borough, we use past trends of employment in each sector in each borough, this time working with 30 sectors. For *de minimis* reasons as well as those of analytical tractability, we forecast separately only those ‘borough sectors’ which have historically accounted for 10 per cent or more of employment in the relevant borough (in five boroughs this threshold was reduced to 9.5 percent to bring in a sector that was very close to 10 per cent). A series ‘Rest’ was then constructed which aggregates all the remaining employment in the borough (in sectors which account for less than 9.5 per cent of the jobs).

The results of this research for 2011 and then five year intervals up to 2031, together with actual data for 2005-7, are shown in Table 1.

Table 1: Trend-based borough employment projections

Borough	Actual '000s			Projection '000s				
	2005	2006	2007	2011	2016	2021	2026	2031
Barking	53	52	51	51	51	50	49	49
Barnet	133	134	134	138	144	150	156	163
Bexley	78	75	75	76	76	76	76	76
Brent	113	112	110	108	107	106	105	104
Bromley	124	124	131	133	135	137	139	141
Camden	279	283	290	300	310	319	329	338
City	337	332	339	345	357	370	383	396
Croydon	152	150	150	147	142	138	133	129
Ealing	135	137	139	140	138	135	132	129
Enfield	114	111	110	110	111	111	112	112
Greenwich	77	80	80	84	86	88	91	93
Hackney	94	90	92	96	99	102	104	107
Hammersmith	128	130	132	141	154	167	181	196
Haringey	77	82	85	89	90	91	92	92
Harrow	84	83	82	84	86	88	90	92
Havering	92	91	85	86	88	91	93	96
Hillingdon	201	203	203	213	227	242	257	274
Hounslow	133	132	134	129	128	128	128	127
Islington	179	182	193	203	217	233	249	267
Kensington	134	130	129	129	136	144	152	161
Kingston	80	86	87	89	91	93	96	98
Lambeth	137	137	136	135	132	129	126	123
Lewisham	77	76	76	78	81	85	89	93
Merton	83	80	81	81	82	83	83	84
Newham	82	85	83	86	88	89	89	90
Redbridge	81	75	76	77	77	77	77	77
Richmond	84	92	92	99	105	110	116	122
Southwark	188	202	217	233	248	262	277	292
Sutton	73	73	73	74	76	77	79	80
Tower Hamlets	180	202	206	225	251	280	311	346
Waltham Forest	72	73	68	72	71	70	69	67
Wandsworth	126	127	127	130	133	137	141	145
Westminster	606	609	610	619	636	655	673	692
London	4588	4632	4676	4797	4953	5114	5280	5452

Source: GLA Economics with the assistance of Volterra Consulting

Site capacity-based employment projections

The research on site capacity carried out by RTP provided the GLA with projections for the additional amount of physical employment capacity expected to come on stream in boroughs before 2008, between 2008 and 2011, between 2011 and 2016, between 2016 and 2021 and between 2021 and 2026. A full description of how RTP compile their 'Greater London Employment Sites Database' is provided in the accompanying London employment sites database Technical Paper 1. The extra site capacity maps into new jobs. Each site is classified according to whether it will be office space, industrial space or 'other' (eg, retail, hotels or leisure). For triangulation purposes, the space classified as 'industrial' was then excluded (as was the case for Working Paper 18). The rationale is that industrial sector employment has been on a trend decline and this is expected to continue. This has led (and will continue to lead) to a release of surplus industrial land to other uses. We exclude this land from our capacity projections because our expectation – given London's acute need for additional housing – is that the vast majority of this land will be used for housing, rather than for workplaces.

RTP used the following employment densities to map new site capacity into jobs (more details are in London employment sites database: Technical Paper 1):

Table 2: Employment density assumptions

Floorspace per worker (sq m)	Central Activities Zone	Rest of Inner London	Outer London
B1 (Offices)	14.4	14.7	20.6
A (Retail)	21	21	21
Other	45	45	45
Mixed	See below		

Source: London employment sites database: Technical paper 1

A large number of sites are identified as mixed-use developments including a housing element. Where the total site area was provided but not the distribution by use, RTP make the judgement that 25 per cent of the site is devoted to employment. Based on case studies of mixed-use developments in Hackney, it is assumed that the employment element of a site is distributed as follows: 18 per cent of the employment component of these 'mixed' sites is used as 'A- class'; 63 per cent as 'Office'; 4 per cent as 'Industrial'; and 15 per cent as 'other'. These employment capacity projections were then mapped into employment projections for 2008, 2011, 2016, 2021 and 2026 using a method similar to that which RTP has previously used to produce site capacity-based employment projections. See Appendix for the algebra of how this is done.

This method allocates job increases to boroughs in accordance with their respective share of the overall new employment capacity coming on stream in the whole of London.

Box 1: Site capacity-based employment projections using Tower Hamlets as an example

Step 1. Change in employment to 2008

RTP's updated London employment sites database (LESD): Technical Paper 1 suggests that no new non-industrial employment capacity will come on stream in Tower Hamlets by 2008 (our first forecast year). The trend projections for London (see Working Paper 38) show an increase of 30,000 in employment between the last actual (2007) and 2008. But Tower Hamlets is allocated zero of this. There is no unused capacity to be carried forward to the next period.

Step 2. Change in employment to 2011

This zero is added onto the 31,897 of new non-industrial employment capacity that the new LESD has coming on stream in Tower Hamlets between 2008 and 2011. After similar calculations are performed for the other 32 boroughs, this 31,900 of new employment capacity represents 17.8 per cent of all London non-industrial employment capacity. The trend projections for London (WP38) show an increase in employment between 2008 and 2011 of 91,000. Accordingly Tower Hamlets is allocated 17.8 per cent of this, or around 16,280 jobs. This leaves around 15,620 of unused capacity ($= 31,900 - 16,280$) to be carried forward to the next period.

Step 3. Change in employment to 2016

The 15,620 is added onto the around 40,900 of new non-industrial employment capacity that the new LESD has coming on stream in Tower Hamlets between 2011 and 2016. After similar calculations are performed for the other 32 boroughs, this 56,520 of new employment capacity represents 20.0 per cent of all London non-industrial employment capacity. The trend projections for London (WP38) show an increase in employment between 2011 and 2016 of 156,000. Accordingly Tower Hamlets is allocated 20.0 per cent of this, or around 31,200 jobs. This leaves around 25,320 of unused capacity ($= 56,520 - 31,200$) to be carried forward to the next period.

Step 4. Change in employment to 2021

The 25,320 is added onto the around 4,300 of new non-industrial employment capacity that the new LESD has coming on stream in Tower Hamlets between 2016 and 2021. After similar calculations are performed for the other 32 boroughs, this 29,620 of new employment capacity represents 13.4 per cent of all London non-industrial employment capacity. The trend projections for London (WP38) show an increase in employment between 2016 and 2021 of 161,000. Accordingly Tower Hamlets is allocated 13.4 per cent of this, or around 21,630 jobs. This leaves around 7,990 of unused capacity ($= 29,620 - 21,630$) to be carried forward to the next period.

Step 5. Change in employment to 2026

The 7,990 is added onto the around 53,400 of new non-industrial employment capacity that the new LESD has coming on stream in Tower Hamlets between 2021 and 2026. After similar calculations are performed for the other 32 boroughs, this 61,390 of new employment capacity represents 23.3 per cent of all London non-industrial employment capacity. The trend projections for London (WP38) show an increase in employment between 2021 and 2026 of 166,000. Accordingly Tower Hamlets is allocated 23.3 per cent of this, or around 38,700 jobs. This leaves around 22,690 of unused capacity (= 61,390 - 38,700) to be carried forward to the next period (except that the LESD only has figures to 2026 so the next period calculation is done in a different way – there is no carry-forward).

Step 6. Change in employment to 2031

The new LESD only has figures up to 2026. In order to generate a projection for the last five year period we simply assume that Tower Hamlets takes the same percentage of the total London wide increase in jobs, 23.3 per cent, that it did for the preceding 2021-2026 period. The trend projections for London (WP 38) show an increase in employment between 2026 and 2031 of 172,000. Accordingly Tower Hamlets is allocated 23.3 per cent of this, or 40,100 jobs.

Step 7. From changes to levels

The above steps give the following changes to employment in Tower Hamlets

Tower Hamlets	Change in Employment
2008	0
2008-11	16,280
2011-16	31,200
2016-21	21,630
2021-26	38,700
2026-31	40,100

In 2007 the level of employment in Tower Hamlets was 206,000 (to the nearest thousand). Combining this with the figures in the above table gives the following projections for the level of employment in Tower Hamlets. All figures to the nearest thousand.

Tower Hamlets	Level of Employment (000s)
2007	206
2008	206
2011	222
2016	253
2021	275
2026	313
2031	353

The results of applying this method for 2011 and five year intervals up to 2031, together with the recorded data for 2005-2007, are shown in Table 3.

Table 3: Site capacity-based borough employment projections

	Actual '000s			Projection '000s				
Borough	2005	2006	2007	2011	2016	2021	2026	2031
Barking	53	52	51	52	53	57	62	67
Barnet	133	134	134	134	135	136	142	147
Bexley	78	75	75	76	76	82	83	85
Brent	113	112	110	118	124	127	130	133
Bromley	124	124	131	131	131	132	134	136
Camden	279	283	290	304	321	331	339	347
City	337	332	339	370	395	411	414	418
Croydon	152	150	150	150	156	159	162	165
Ealing	135	137	139	139	140	141	146	151
Enfield	114	111	110	110	111	112	114	116
Greenwich	77	80	80	83	86	109	116	124
Hackney	94	90	92	94	97	98	99	100
Hammersmith	128	130	132	139	146	151	157	163
Haringey	77	82	85	85	86	87	91	94
Harrow	84	83	82	82	82	82	83	84
Havering	92	91	85	89	91	92	96	99
Hillingdon	201	203	203	213	216	218	220	221
Hounslow	133	132	134	136	138	139	143	148
Islington	179	182	193	196	202	206	209	211
Kensington	134	130	129	130	131	132	133	134
Kingston	80	86	87	87	87	87	89	91
Lambeth	137	137	136	137	143	146	155	163
Lewisham	77	76	76	76	77	78	85	91
Merton	83	80	81	82	82	82	83	83
Newham	82	85	83	87	93	127	150	174
Redbridge	81	75	76	76	77	77	77	78
Richmond	84	92	92	92	92	92	92	93
Southwark	188	202	217	223	235	242	249	256
Sutton	73	73	73	73	73	73	74	74
Tower Hamlets	180	202	206	222	253	275	313	353
Waltham Forest	72	73	68	69	69	69	70	71
Wandsworth	126	127	127	129	137	143	146	150
Westminster	606	609	610	614	618	621	627	633
London	4588	4632	4676	4797	4953	5114	5280	5452

Source: GLA Economics calculations based on data from Roger Tym and Partners

Transport accessibility-based employment projections

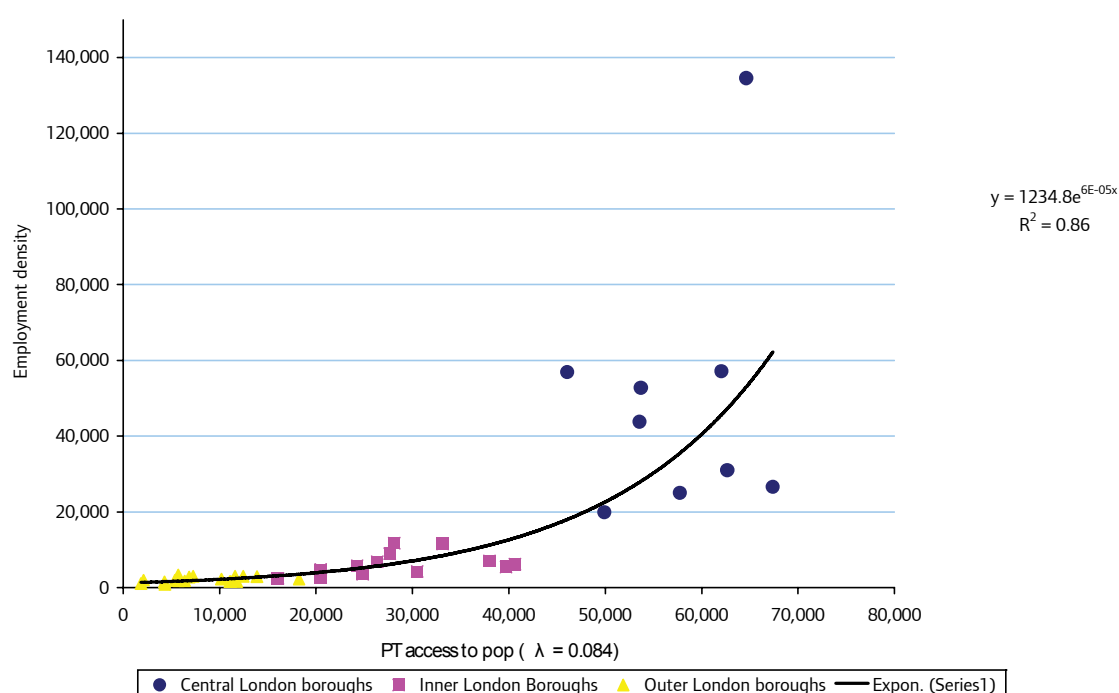
Colin Buchanan and Partners (CBP) were commissioned by GLA Economics to investigate how future changes in employment might be distributed according to future changes in accessibility. The full details of this research are set out in Accessibility-based employment projections: Technical Paper 2.

The model used is the 'gravity model'. The underlying rationale of this model is that the easier it is to reach a location and the greater the numbers within journey time from the

location, the more development and therefore employment that location will attract. A constant is included in the modelled relationship to allow for the relative significance of shorter and longer journey times (a 'best fit' value of this is calculated).

Figure 1a shows the relationship between employment density in the London boroughs and Public Transport (PT) accessibility (expressed as access to population). The data is for 2006 (PT access to population) and 2007 (population estimates). The boroughs were divided according to whether they are in Central, Inner or Outer zones.

Figure 1a: Employment density versus PT access to population



Source: Accessibility-based employment projections: Technical Paper 2

The statistical relationship is strong (R^2 0.86). The three clusters of boroughs are quite distinct with Central boroughs on the right of the chart with high density/high accessibility and Outer boroughs on the left of the chart with low density/low accessibility. Inner boroughs are in the middle.

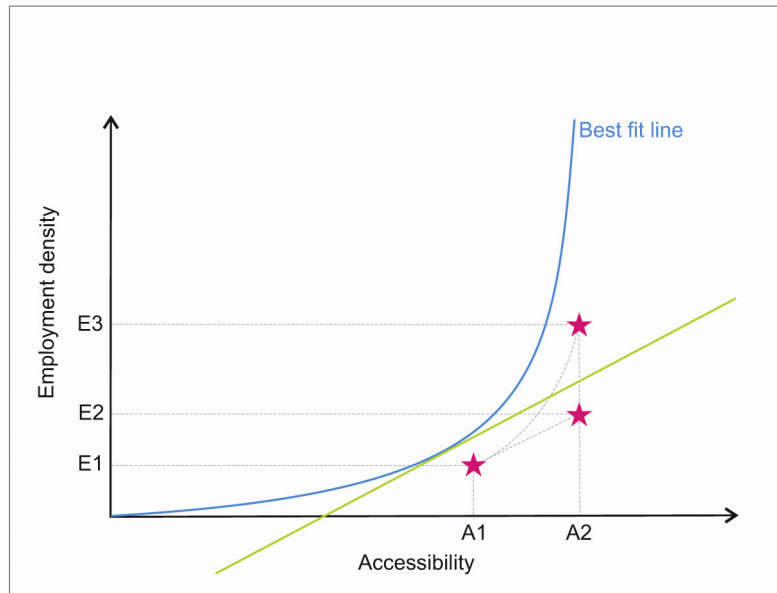
Figure 1a shows that the greater is accessibility and employment density, the more does an additional 'unit' of accessibility boost employment (in other words the relationship is exponential).

To use the relationship in Figure 1a to project forward, two assumptions were made.

First, if accessibility for borough A increases, then employment density will increase but the percentage difference of borough A's co-ordinate from the fitted curve will be preserved. This is shown in Figure 1b by the move from E1 to E3.

Second, above a certain level of accessibility, additions raise employment in a straight line (the tangent to the curve pre-addition), rather than along the exponential curve. This is shown in Figure 1b by the move from E1 to E2.

Figure 1b: Using the accessibility/density relationship to forecast



CBP found that a number of boroughs see accessibility peak with Crossrail in 2016 and then fall away in 2026 and 2031. The reason for this is explained in Technical Paper 2. Briefly, there are no specific infrastructure projects after 2016 and with an increase in traffic congestion and rail crowding assumed, accessibility falls. We thought it was more realistic to assume that transport infrastructure spending from 2016 precisely offsets the increase in crowding and congestion, so that accessibility effectively remains constant from 2021 onwards (the 2026 and 2031 projections, assuming no infrastructure spending whatsoever, can be found in Technical Paper 2, Table 4.1).

The infrastructure spending that is specified in TfL's LTS (London Transportation Studies) model is set out in Table 4 below.

Table 4: Future public transport provision specified in LTS

Public Transport Provision Assumptions	2006	2016	2026	2031
Heathrow Express to Terminal 5	x	✓	✓	✓
Channel Tunnel Rail Link (CTRL) domestic and international	x	✓	✓	✓
North London Railway Service Level Commitment Phases 1 - 2 (East London Line/North London line / West London line except E London Line ext Phase 3)	x	✓	✓	✓
HLOS (network Rail) commitments (rail capacity increases on South West London, Southern, Thameslink, South Eastern, Great Eastern, c2c, West Anglia, London Midland)	x	✓	✓	✓
Crossrail 1	x	✓	✓	✓
Full PPP (Public Private Partnership) improvements on Jubilee	✓	✓	✓	✓
Full PPP upgrades (except on Jubilee)	x	✓	✓	✓
Hammersmith and city stop at Wood lane	x	✓	✓	✓
PPP upgrade on Bakerloo	x	x	✓	✓
Piccadilly line extension to Terminal 5	x	✓	✓	✓
Underground Reliability - Global Effect increase	✓	✓	✓	✓
Underground reliability - individual line effect - RailPlan	x	✓	✓	✓
DLR bank to Lewisham and Poplar to Stratford 3-car upgrade	x	✓	✓	✓
DLR extension to Woolwich	x	✓	✓	✓
DLR Stratford international	x	✓	✓	✓
2016/2017 bus frequency improvements	x	✓	✓	✓
Bus reliability decreases	x	✓	✓	✓
boarding alighting improvements 2001	✓	✓	✓	✓
Development area buses – Thames Gateway	x	✓	✓	✓
East London Transit Phase 1	x	✓	✓	✓
Greenwich Waterfront Transit Phase 1	x	✓	✓	✓

Table 5 shows the employment projections based on changes in accessibility. As explained above, the assumption is made that transport infrastructure spending from 2016 precisely offsets the increase in crowding and congestion, so that accessibility effectively remains constant from 2021. (The reason that the 2016, 2021 and 2026 projections are different is because we constrain them to add to the London-wide 'trend-based' projections).

Table 5: Accessibility-based borough employment projections

Borough	Actual '000s			Projection '000s				
	2005	2006	2007	2011	2016	2021	2026	2031
Barking	53	52	51	51	51	51	52	54
Barnet	133	134	134	135	138	135	140	144
Bexley	78	75	75	73	73	71	74	76
Brent	113	112	110	111	114	112	115	119
Bromley	124	124	131	128	127	124	128	132
Camden	279	283	290	311	336	352	364	376
City	337	332	339	395	417	452	467	482
Croydon	152	150	150	145	143	140	144	149
Ealing	135	137	139	136	136	139	143	148
Enfield	114	111	110	108	109	110	114	117
Greenwich	77	80	80	79	79	79	82	84
Hackney	94	90	92	94	97	101	104	108
Hammersmith	128	130	132	138	147	147	152	156
Haringey	77	82	85	86	88	89	92	95
Harrow	84	83	82	81	82	80	83	85
Havering	92	91	85	82	81	81	84	86
Hillingdon	201	203	203	199	199	196	203	209
Hounslow	133	132	134	129	127	125	129	133
Islington	179	182	193	206	222	232	239	247
Kensington	134	130	129	139	151	153	158	163
Kingston	80	86	87	84	82	81	83	86
Lambeth	137	137	136	137	139	139	143	148
Lewisham	77	76	76	76	76	75	77	80
Merton	83	80	81	82	84	82	85	88
Newham	82	85	83	87	93	97	100	103
Redbridge	81	75	76	73	72	73	76	78
Richmond	84	92	92	89	87	85	88	91
Southwark	188	202	217	217	220	225	232	240
Sutton	73	73	73	71	71	69	72	74
Tower Hamlets	180	202	206	214	225	247	255	263
Waltham Forest	72	73	68	67	66	66	68	70
Wandsworth	126	127	127	125	125	123	127	131
Westminster	606	609	610	650	698	784	809	836
London	4588	4632	4676	4797	4953	5114	5280	5452

Source: GLA Economics calculations based on data from Colin Buchanan and Partners

Putting the three projections together: Triangulation

To recap: We now have employment projections on three different bases: trend, accessibility and capacity. Now we need to consider how to combine them. The first step is to compare them. This is done for 2016 in Figures 2a and 2b below and for 2031 in Figures 3a and 3b.

Figure 2a: Projected employment in 2016: Barking to Hillingdon

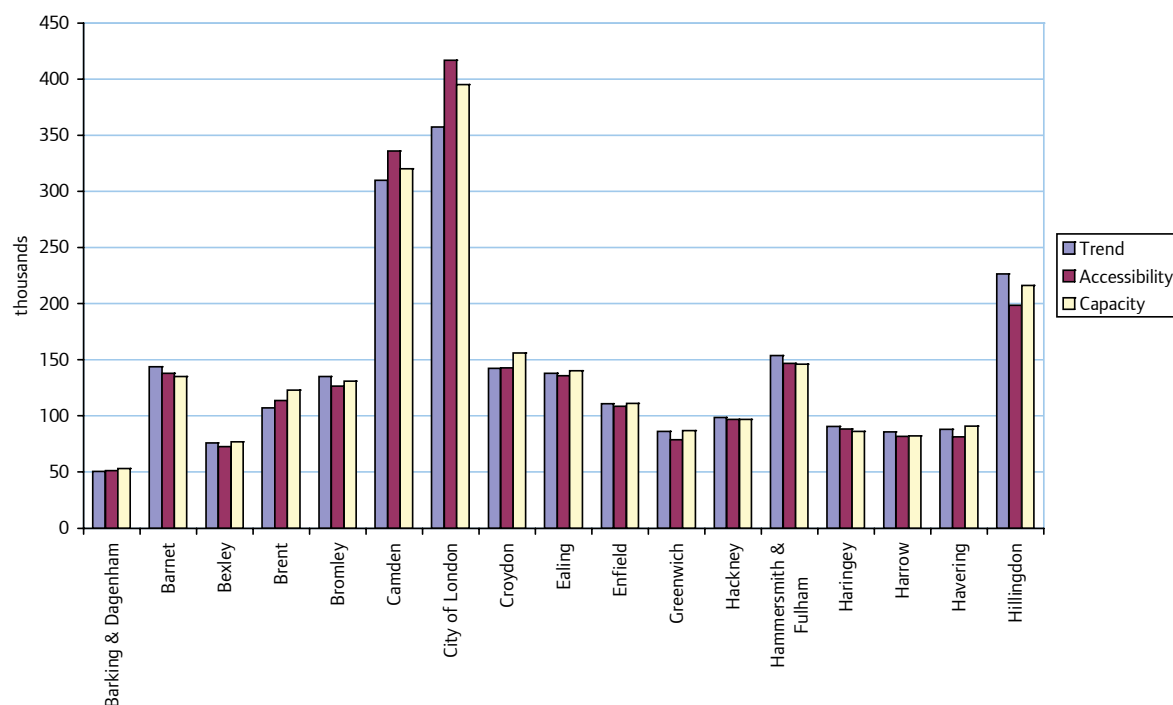
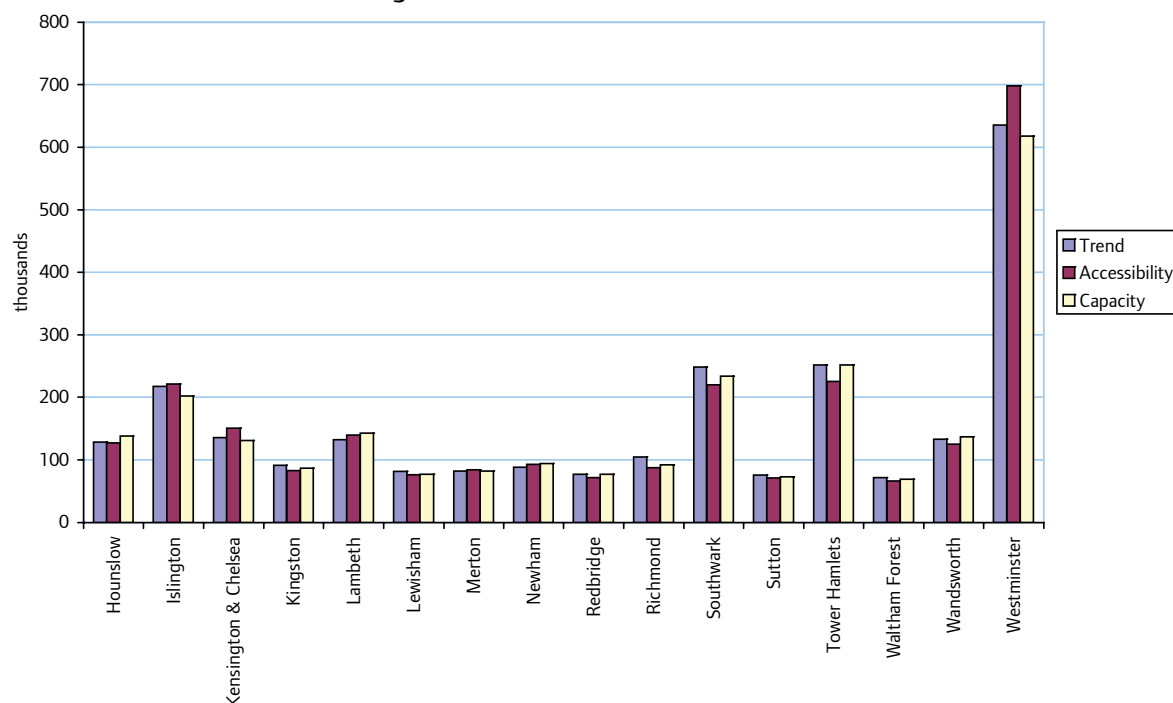


Figure 2b: Projected employment in 2016: Hounslow to Westminster

Nb. Different scale between Figures 2a and 2b



Figures 2a and 2b show the difference between the three methods of projecting employment for the year 2016. There are six boroughs for which the highest of the three projections exceeds the lowest by more than 20,000 in 2016. In descending order these are Westminster (80,000), City of London (60,000), Hillingdon (28,000), Southwark (28,000), Tower Hamlets (28,000) and Camden (26,000).

There are four boroughs where there is a percentage difference in 2016 of at least 15 per cent between the highest and the lowest projection: Richmond (20%), City of London (17%), Brent (16%) and Kensington and Chelsea (15%).

Figure 3a: Projected employment in 2031: Barking to Hillingdon

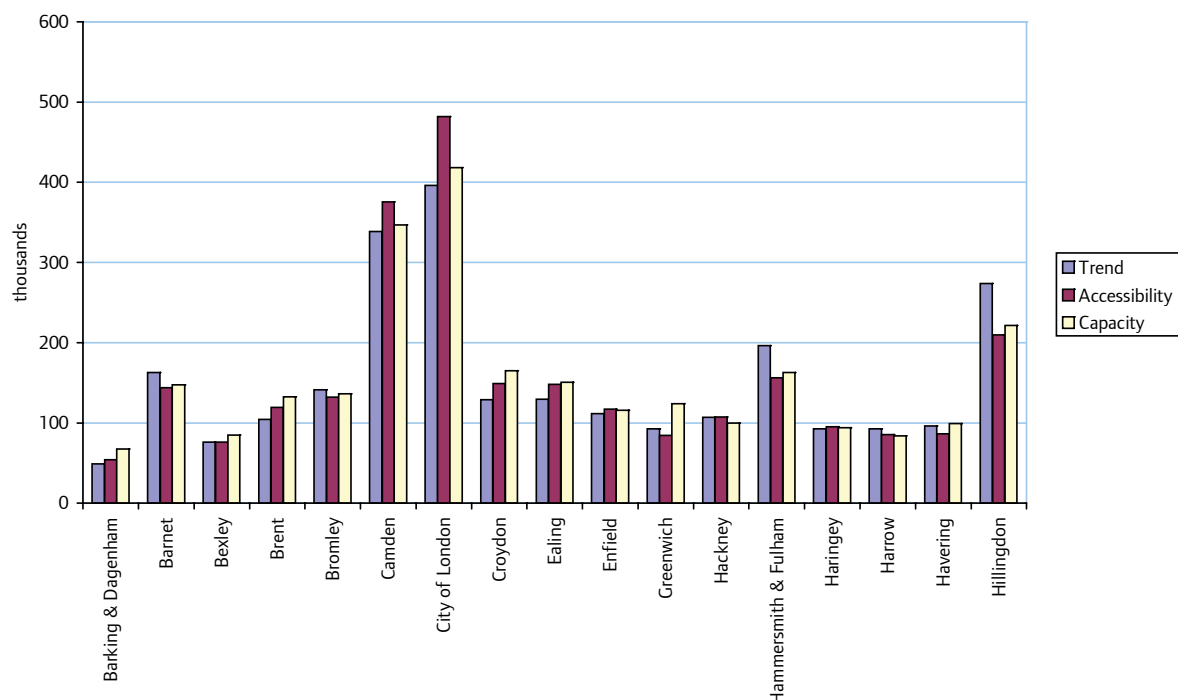
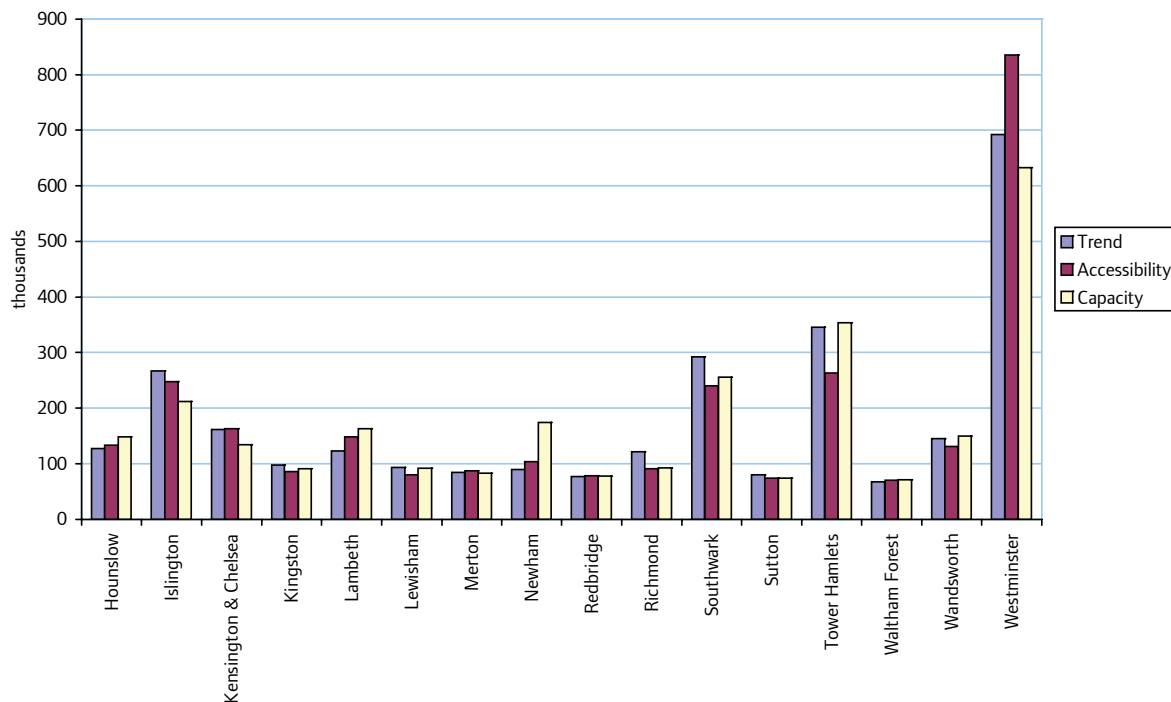


Figure 3b: Projected employment in 2031: Hounslow to Westminster

Nb. Different scale between Figures 3a and 3b



Similarly Figures 3a and 3b show that there are also some considerable differences between the three methods for some boroughs in 2031. Seven boroughs have a range of more than 50,000 between the lowest of the three projections and the highest. Westminster has the largest range, with accessibility 203,000 above capacity. Then comes the City of London (accessibility 86,000 above trend), Tower Hamlets (trend 90,000 above accessibility), Newham (capacity 84,000 above trend), Hillingdon (trend 65,000 above accessibility), Islington (trend 56,000 above capacity) and Southwark (trend 52,000 above accessibility).

As in Working Paper 18, a set of rules needs to be adopted to combine the three different projections for each borough into a single projection that can be used for planning purposes.

Combining the trend, accessibility and site capacity-based projections

Clearly, in the absence of autarky (that is, self-sufficiency), transport is a prerequisite for economic growth and so is the availability of land and appropriate buildings. For a company looking at locating in London, relatively good transport accessibility and a plentiful supply of appropriate space are factors that will attract them, whereas poor transport links and/or a scarcity of appropriate space are disincentives to locating in a particular borough.

Improvements in transport accessibility give employers in a given location a bigger pool from which to draw their workforce. This allows unit costs to be reduced and also boosts productivity by enabling employers to more closely match their workforce to the required skills. Similarly if there is plenty of site capacity available at a particular location, employers

are likely to be attracted, both because of the presence of available premises in what is an illiquid market but also because rents are likely to be competitive for ‘first movers’ in new developments. However over time this will lead to rising rents, so will not be a permanent advantage for the location in question, whereas better transport accessibility – if unmatched elsewhere – has lasting benefits.

Some boroughs with expected future improvements in accessibility and additional site capacity seem set for stronger growth in employment than in the past. An example is Newham. In the years 1982 to 1995, employment only rose in one year (1987). By 2007 the 1982 level of employment had barely been regained. But in the forecast period, Newham seems set to become much more attractive to employers, as a result of a doubling of the employment supported by site capacity and a near 20 per cent rise in accessibility. Hence it seems reasonable to project faster employment growth than suggested by the trend-based projections – a rise from just 83,000 to 90,000 between 2007 and 2031. One factor in the rise in accessibility for Newham will be Crossrail, which will significantly reduce the travel time to West London. The Heathrow/Stratford journey will take 40 minutes, compared with the current 70 minutes.

On the other hand there are boroughs where employment has grown rapidly in the past but which are now ‘mature’ – that is, where the transport infrastructure has already been extended and where new employment sites are limited, either by land availability or by local planning policies. In these boroughs employment may reasonably be expected to grow more slowly than in the trend-based projections. An example is Southwark. Employment in Southwark grew rapidly – by nearly 40 per cent – in the decade 1997–2007, to 217,000. However the accessibility-based employment projections show a slowing, with an increase to just 240,000 by 2031, and the site capacity-based projections also show a deceleration, to 257,000 by 2031, as the area and scope available for new sites is limited. This may push up rents relative to other boroughs, reducing the incentive for companies to locate in Southwark.

This leads to the question of what happens when the trend forecasts for employment in a particular borough exceed the site capacity-based or accessibility-based projections.

Exceeding the site capacity-based projections

The site capacity-based projections depend on assumptions about the number of buildings that are or are expected to be on particular sites (‘plot ratios’) plus assumptions about the average area of floor space per employee (see Table 2). With regard to ‘plot ratios’, SDS Technical Report 21² notes that plot ratios can vary widely depending on the number of floors a building on a particular sized plot has and other factors such as the extent of landscaping and car parking. However, it seems plausible that plot ratios can be varied much more easily for new offices than for the existing stock of offices, factories etc. Hence the focus here on floorspace-employment ratios.

² ‘Demand and Supply of Business Space in London’, SDS Technical Report 21, August 2002 report produced by Roger Tym and Partners; see also 2007 URS study “Demand and Supply of Land for Logistics in London.”

As was noted in WP18, there is evidence (both anecdotal and observed) that employers respond to a relative scarcity of sites in a location that they would otherwise favour by adding more workers into a given floorspace. SDS Technical Report 21 states that average floorspace per worker figures “conceal a significant variation in actual figures”. This report also indicates that average floorspace per worker figures “conceal a significant variation in actual figures”. This report also indicates that the adoption of more flexible working practices (such as ‘hot desking’ and home working) reduces the amount of office space per worker required by between 9 per cent for Administration Centres to 16 per cent for Sales Offices. Other factors that were found to be associated with variations in employment density included firm size (employment density rises with size); the year a company moved in to its premises (the earlier, the lower density); and whether the premises are leasehold or freehold (floorspace per worker is less in leasehold than in freehold offices).

The report also details floorspace per worker figures for both offices and industrial use for all London’s boroughs. There is a wide degree of variation in these figures across boroughs. However the extreme ends of the distributions are driven by special factors. If we instead focus on the middle third of the distribution, office floorspace per worker varies from 13m² to 16m² – a spread of around 20 per cent. The equivalent variation in industrial floorspace per worker is even greater – from 40m² to just under 60m², a spread of more than 30 per cent.

More recently RTP have undertaken research on workspace for the LDA. Their report³ indicated a wide variation in employment densities – as shown in Table 6. The figures in brackets show the percentage difference between the higher or lower quartile and the median. The extent of variation in employment densities reported by RTP is affected by some premises being very underoccupied.

³ ‘The Use of Business Space in London’, Report November 2005 by Roger Tym and Partners for the London Development Agency.

Table 6: Distribution of employment densities

M ² per worker	Lower Quartile	Median	Higher Quartile
Office	10.7 (-37%)	17.0	26.3 (55%)
Factory	23.7 (-46%)	43.7	70.1 (60%)
Garage	27 (-49%)	52.4	101.0 (93%)
Warehousing	23.6 (-45%)	43.2	85.3 (97%)

Source: RTP

Given this evidence and as noted in WP18, it seems reasonable to assume that the site capacity-based employment projections could potentially be exceeded by up to 10 per cent if the trend-based or accessibility-based employment projections were higher. This assumption might even be conservative.

Going beyond the transport accessibility projections

TfL's LTS model (used by CBP) explicitly includes boarding time, wait time and crowding penalties, on top of journey time. The crowding model increases 'in vehicle' time by a variable amount depending on the level of demand compared to capacity on each link. So a crowding 'penalty' of 1 is used for links which are uncrowded, meaning no additional uplift is applied to the value of time. A crowding penalty of 1.5 means that the level of crowding is such that in the judgment of TfL, 50 per cent should be added to the value of time.

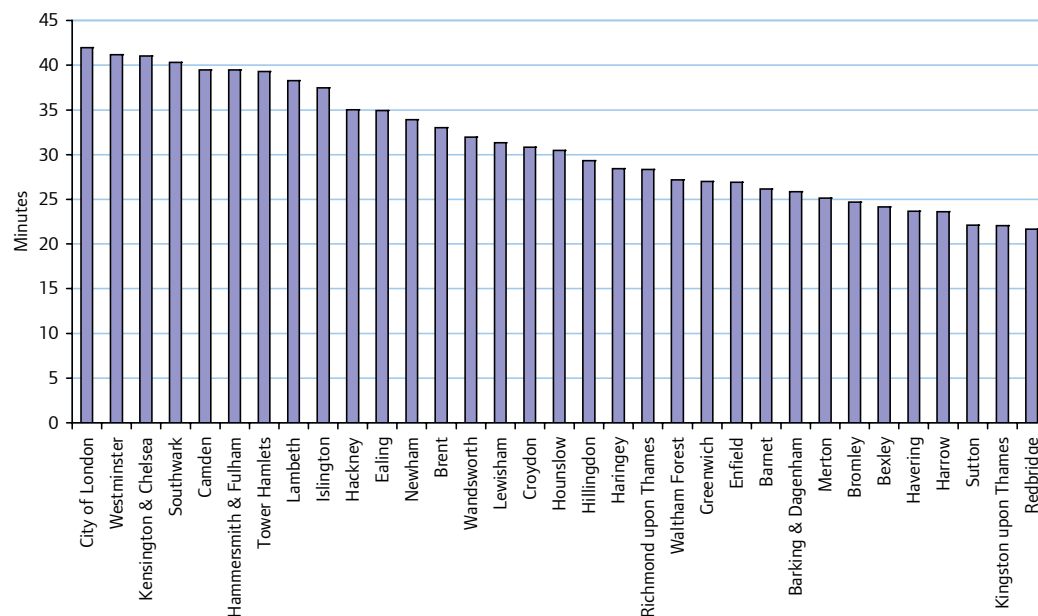
However some people are prepared to commute for unusually long times and Table 7 shows that people are prepared to commute for longer for jobs in central London. This may be because there are jobs in central London which simply cannot be found elsewhere in the capital, or because of higher remuneration on offer there - or a combination of the two. Jobs in investment banks or funds/hedge funds in the West End, the City or Canary Wharf are the obvious examples.

Table 7: Usual travel to work time by employment location (%)

	Central London	Rest of Inner London	Outer London	Total
10 mins or less	3	11	19	11
11 to 20 mins	8	18	27	17
21 to 30 mins	14	18	20	17
31 to 40 mins	12	9	8	10
41 to 50 mins	16	13	9	13
51 to 60 mins	24	17	10	17
More than 60 mins	21	14	7	14
Average (mins)	53	42	32	43

Source: Annual Population Survey (2008)

Figure 4: Travel times to work in all the London Boroughs (2005-2008, average)



More detailed information on average travel times to workplace location is available from the London Area Transport Survey. This shows shorter travel times on average relative to that in Table 7 because it only covers trips starting from inside the M25 (the orbital road around London). The data is shown in Figure 4. The evidence from this chart points the same way as Table 7. The longest journey times are to the central London boroughs of The City and Westminster, and travel times to jobs in inner London boroughs tend to be longer than those to outer London boroughs.

We reflect the willingness to commute for longer to work in central London as follows: If accessibility is the ‘constraint’, then we increase the accessibility-based employment projections by 10 per cent for Camden, The City, Islington, Kensington and Chelsea, Tower Hamlets, Hammersmith and Fulham, Southwark, Lambeth and Westminster and then compare them with the other employment projections for these boroughs. Note that in contrast to WP18, we do not allow a 20 per cent ‘uplift’ for The City and Westminster. This is because we judged that the extra crowding in those two boroughs is already adequately represented by the crowding penalties in TfL’s LTS model (used by CBP). To have added an additional 10 per cent uplift would have risked ‘double counting’.

Summary of “Rules” for Projections

The above reasoning is set down in the rules⁴ in Table 8 which we use to combine the employment projections on the three different bases (trend, accessibility and capacity).

⁴ These are the same as in WP18.

Table 8: Rules for combining the employment projections on the three bases

Ordering of projections	Projection Rule	Comments
If Trend > Capacity	At Trend projection if Trend < Capacity + 10% for all boroughs. At Capacity + 10% if trend is above this enhanced level of capacity	The trend projection is feasible if employers have scope to squeeze in extra workers. If not then the capacity constrains employment after allowing for such squeezing in.
If Trend > Accessibility	To Accessibility projection for most boroughs. To Trend if Trend < Accessibility + 10% for Camden, Islington, Kensington and Chelsea, Tower Hamlets, Hammersmith and Fulham, Southwark, and Lambeth. To Accessibility +10% for Camden, Islington, Kensington and Chelsea, Tower Hamlets, Hammersmith and Fulham, Southwark, and Lambeth, if Trend > Accessibility +10% for these boroughs.	The trend projection for certain inner London boroughs is feasible if workers are willing to travel for longer into them. Otherwise the accessibility- based projection constrains employment. For certain inner London boroughs it constrains employment after allowing for some additional willingness to travel on the part of workers.
Trend > both Capacity and Accessibility.	Use rules above. Employment constrained to whichever constraint provides the lower number	
Trend < Capacity	To Capacity-based projection	A plentiful supply of site capacity increases the attractiveness of the location so that historic performance can be bettered.
Trend < Accessibility	To Accessibility-based projection.	Improved accessibility increases the attractiveness of the location so that historic performance can be bettered.
Trend < both Capacity and Accessibility.	To the lowest of the Capacity and Accessibility- based projections.	The historic trend can be bettered, to the extent allowed by the lower of the Capacity and Accessibility factors.

The Results

The above rules were used to produce borough-level employment projections for 2011, 2016, 2021, 2026 and 2031. The sum of the projected levels of employment in all 33 boroughs at each date was then compared with the projected London wide level of employment from the trend-based projections. This sum was constrained to be equal to the trend-based London wide projection by pro-rating the borough levels projections as necessary, by an equal proportion. The resulting projections are our finalised triangulated projections. They are set out in Table 9.

Table 9: Triangulated Employment Projections by Borough

Borough	Actual '000s			Projection '000s				
	2005	2006	2007	2011	2016	2021	2026	2031
Barking	53	52	51	51	52	52	54	56
Barnet	133	134	134	136	140	139	145	150
Bexley	78	75	75	74	74	73	76	79
Brent	113	112	110	112	116	115	119	124
Bromley	124	124	131	129	129	128	132	137
Camden	279	283	290	307	326	340	350	361
City	337	332	339	373	401	423	428	435
Croydon	152	150	150	146	145	144	149	155
Ealing	135	137	139	137	138	143	148	154
Enfield	114	111	110	109	111	113	118	121
Greenwich	77	80	80	80	80	81	85	87
Hackney	94	90	92	95	98	104	107	111
Hammersmith	128	130	132	139	149	166	173	178
Haringey	77	82	85	87	89	92	95	98
Harrow	84	83	82	82	83	82	86	88
Havering	92	91	85	83	82	83	87	89
Hillingdon	201	203	203	201	202	202	210	217
Hounslow	133	132	134	130	129	129	133	138
Islington	179	182	193	205	220	233	238	241
Kensington	134	130	129	131	138	148	151	153
Kingston	80	86	87	85	83	83	86	89
Lambeth	137	137	136	138	141	143	148	154
Lewisham	77	76	76	77	77	77	80	83
Merton	83	80	81	83	83	84	86	87
Newham	82	85	83	88	94	100	103	107
Redbridge	81	75	76	74	73	75	79	81
Richmond	84	92	92	90	88	87	91	95
Southwark	188	202	217	241	246	255	264	275
Sutton	73	73	73	72	72	71	74	77
Tower Hamlets	180	202	206	227	251	279	290	301
Waltham Forest	72	73	68	68	67	68	70	73
Wandsworth	126	127	127	126	127	127	131	136
Westminster	606	609	610	624	646	674	696	720
London	4588	4632	4676	4797	4953	5114	5280	5452

Appendix: Mapping RTP's employment capacity projections into employment projections

For the initial period to 2008:

$$\Delta ce_{i,2008} = (\Delta c_{i,2008}) / (\sum c_{i,2008}) * \Delta E_{L,2008}$$

For subsequent periods

$$\Delta ce_{i,t} = (\Delta c_{i,t} + (\Delta c_{i,t-5} - \Delta ce_{i,t-5})) / (\sum \Delta c_{i,t} + \sum (\Delta c_{i,t-5} - \Delta ce_{i,t-5})) * \Delta E_{L,t}$$

where:

$\Delta ce_{i,t}$ is the projected site capacity based change in employment in borough i in the last five years up to time t

$\Delta c_{i,t}$ is RTP's employment capacity projections for borough i in the five years up to time t (except for 2008 where the interval is three years from the last actual data point of 2005).

$\sum \Delta c_{i,t}$ is the sum of these borough employment capacity projections for all of London.

$\Delta E_{L,t}$ is the projected change in employment in the whole of London in the five years up to time t (except for 2008 where the interval is three years from the last actual data point of 2005) from the trend-based London projections as set out in GLA Economics Working Paper 38.

$\Delta c_{i,t-5} - \Delta ce_{i,t-5}$ is the spare employment capacity in borough i left vacant from the previous five year period.

$\sum (\Delta c_{i,t-5} - \Delta ce_{i,t-5})$ is the sum of this spare capacity for all of London.

This method allocates job increases to boroughs in accordance with their respective share of the overall new employment capacity coming on stream in the whole of London.

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Vietnamese

Nếu bạn muốn có văn bản tài liệu này bằng ngôn ngữ của mình, hãy liên hệ theo số điện thoại hoặc địa chỉ dưới đây.

Greek

Αν θέλετε να αποκτήσετε αντίγραφο του παρόντος εγγράφου στη δική σας γλώσσα, παρακαλείστε να επικοινωνήσετε τηλεφωνικά στον αριθμό αυτό ή ταχυδρομικά στην παρακάτω διεύθυνση.

Turkish

Bu belgenin kendi dilinizde hazırlanmış bir nüshasını edinmek için, lütfen aşağıdaki telefon numarasını arayınız veya adrese başvurunuz.

Punjabi

ਜੇ ਤੁਹਾਨੂੰ ਇਸ ਦਸਤਾਵੇਜ਼ ਦੀ ਕਾਪੀ ਤੁਹਾਡੀ ਆਪਣੀ ਭਾਸ਼ਾ ਵਿਚ ਚਾਹੀਦੀ ਹੈ, ਤਾਂ ਹੇਠ ਲਿਖੇ ਨੰਬਰ 'ਤੇ ਫ਼ੋਨ ਕਰੋ ਜਾਂ ਹੇਠ ਲਿਖੇ ਪਤੇ 'ਤੇ ਰਾਬਤਾ ਕਰੋ:

Hindi

यदि आप इस दस्तावेज की प्रति अपनी भाषा में चाहते हैं, तो कृपया निम्नलिखित नंबर पर फोन करें अथवा नीचे दिये गये पते पर संपर्क करें

Bengali

আপনি যদি আপনার ভাষায় এই দলিলের প্রতিলিপি (কপি) চান, তা হলে নীচের ফোন নম্বরে বা ঠিকানায় অনুগ্রহ করে যোগাযোগ করুন।

Urdu

اگر آپ اس دستاویز کی نقل اپنی زبان میں چاہتے ہیں، تو براہ کرم نیچے دئے گئے نمبر پر فون کریں یا دیئے گئے پتے پر رابطہ کریں

Arabic

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Gujarati

જો તમને આ દસ્તાવેજની નકલ તમારી ભાષામાં જોઈતી હોય તો, કૃપા કરી આપેલ નંબર ઉપર ફોન કરો અથવા નીચેના સરનામે સંપર્ક સાધો.

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