MAYOR OF LONDON

Scenario Testing for the Further Alterations to the London Plan

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Prepared by Berkeley Hanover Consulting Ltd
(in association with BWA and Michael Ling)
for the Greater London Authority

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Appendices A to E can be downloaded from the Greater London Authority Website at www.london.gov.uk/gla/publications/planning.jsp

EXECUTIVE SUMMARY

A. Purpose of Study

Broad scenario development is increasingly regarded as good planning practice and has usefully informed preparation of other regional strategies. To inform preparation of the Further Alterations to the London Plan, the GLA has therefore commissioned scenarios which complement and are informed by new research on climate change but focus on the key economic and demographic drivers of change identified in the 2004 Plan and the transport provision necessary to accommodate them. The scenarios also take account of possible changes in the other drivers of change: those associated with lifestyles and values, new technology and social justice.

The further alterations to the London Plan are relatively few in number, do not entail any change to the guiding vision of the 2004 Plan and do not involve significant amendments to its objectives or core assumptions, other than proposing a more effective response to climate change. Specific research is being undertaken to test the implications of this.

The objectives of this project were to:

i) develop, refine and justify a set of broad scenarios illustrating possible future London circumstances, especially in economic, demographic and transport terms; and

ii) test the robustness of the London Plan's objectives and key policies in the light of the scenarios, identifying those objectives and key policies that may be at risk in the light of changes to the main drivers of change.

The project has been carried out in parallel with, and has informed, preparation of the further alterations to the London Plan. It will also inform the SA/SEA process. It has drawn on data that was current at the time, recognising that information will be updated as the alterations go through their preparation process.

B. Scenarios

Scenarios explore possible alternative futures for the conditions under which the London Plan may need to operate. Given the Plan's broad focus, the great variability in external conditions and the gross uncertainties about how these could impact upon London, it is impractical in the context of this research to devise scenarios reflecting responses to specific events and external changes. We have therefore built scenarios that represent the plausible range of outcomes for the key variables affecting the future of London: population change, job growth and locally/centrally funded major transport infrastructure and drawn out their high level implications for the other drivers of change identified in the 2004 Plan – the environmental imperative, especially new proposals to address climate change, lifestyles and values and social justice. .

Our long term scenarios are not intended to represent forecasts of particular, more or less likely, futures but to serve as helpful tools for understanding which threats planners need to be looking out for and responding to in order to be able to avoid or mitigate their undesirable consequences.

Starting from a Baseline Scenario, representing the most likely conditions and those assumed in devising the London Plan policies, we generated upper and lower variant scenarios based on the range of outcomes from independent projections of population and jobs, which are considered to be the main drivers of change.

Population

The population range for the scenarios was based on population projections prepared for the study by the GLA, reflecting the high and low variants for international migration and fertility rates used in the latest Government Actuary Department's UK population projections. For inclusion in the scenarios, these unconstrained projections were then constrained by assumptions about housing capacity/delivery from the London Housing Capacity Study, allowing for variations in household size.

The high population growth projection assumes that London accounts for its share of net international migration to the UK at levels similar those of recent years. This has very substantial implications for the potential future level of London's population, which could rise by about one million between 2006 to 2016, nearly half a million more than under the Baseline Scenario; and by 1.7 million to 2026, nearly 0.9 million more than under the Baseline Scenario. The low population growth projection reflects lower levels of migration and strong socio-economic and demographic forces leading to falling household size.

Jobs

The employment component of the scenarios was developed using sectoral and total job forecasts prepared for the Revised London Plan by Volterra. The latter are based on trend analysis and assume a continuation of employment growth at the same sectoral rates as in selected past periods and future growth of London's real GVA at 2.5% per annum. We used the same approach to develop scenarios at the upper and lower end of a plausible range, based on the statistical margin of error around Volterra's baseline sectoral growth rates and assuming an annual GVA growth range from 2% to 3%. This projected range of trends around the baseline is consistent with a substantial level of economic variability, as occurred during the years from which the past trends were drawn. These include a period of high fuel price volatility[1].

Scenarios for analysis

Four scenarios were selected from a very wide array of potential combinations of different population and job projections. The Baseline Scenario embodied the population and job assumptions underlying the Revised London Plan. "Higher Growth" and "Lower Growth" scenarios were generated by combining the upper levels of employment and population growth and the lower levels, respectively. A fourth "Spatially Constrained" Scenario was also developed, using the high population and job levels from the Higher Growth Scenario but taking as its premise that office-based businesses might be reluctant to expand into east London on the scale aimed for by the London Plan. The population and job levels from 2001 to 2026 for all the scenarios are shown in Table 1.

[1] GLAeconomics. London's Economic Outlook: Spring 2006. GLA,2006

Table 1 Population and Jobs by Scenario, 2001 to 2026 (millions)

Year	Baseline		Lower Growth		Higher Growth/Spatially Constained	
	Pop	Jobs	Pop	Jobs	Pop	Jobs
2001	7.32	4.55	7.32	4.55	7.32	4.55
2006	7.51	4.60	7.51	4.56	7.51	4.64
2011	7.82	4.82	7.66	4.75	8.10	4.88
2016	8.05	5.04	7.81	4.94	8.54	5.12
2021	8.18	5.24	7.81	5.14	8.91	5.34
2026	8.33	5.45	7.82	5.33	9.17	5.58

Transport scenarios

The combined population and job scenarios were tested against two transport delivery scenarios agreed with TfL: the Baseline Case (BC) and the London Plan Case (LPC). The BC mainly comprises infrastructure projects that have received funding and/or are certain to commence operations by 2011, together with the upgrading of a number of LUL lines and stations and the opening of the Thames Gateway Bridge between 2012 – 2021, and Crossrail 1 after 2017. The LPC includes a number of additional schemes, including Thameslink 2000, together with the introduction of a Road User Charging scheme and other travel demand measures.

Other London Plan drivers

The London Plan identifies four other forces driving change in London. However, while these will have important implications for the future of London and the achievement of the London Plan objectives, they do not present a range of possible futures, which are likely to have differential impacts on the spatial planning of the city.

Climate change

Climate change does not constitute a variable element for spatial planning in the same way as, for example, demographic, transport and economic change. There is a solid body of scientific evidence about the probable effects of climate change over the Plan period (Appendix E). Because of the effects already created in the past, there is relatively little prospect of bringing about strategic levels of variation until 2050. Moreover, the main potential for strategic variation would be political, corporate and personal behavioural change of massive dimensions - mainly in other continents - which is far removed from the spheres of influence of spatial planning for London. So the Mayor has to plan to adapt to the unavoidable in the short term and to mitigate its effects in so far as he is able to for longer term benefits.

Lifestyles and values,

The London Plan identifies a move to a higher density, more urban, intensive, continental lifestyle, with less sharp separation of work and home. The changes in preferred working practices that this implies, supported by further developments in new technology, could have impacts on business location and transport demand. Concerns for higher personal safety in the face of increased security threats could also influence transport use and household location decisions. Such tendencies, however, are not considered to be potentially strong or distinctive enough to justify an exploration of their implications on plan policies through specific scenarios.

New Technology

Economic activity in London is subject to processes of transformation that will continue to come from a wide variety of sources - changes in market concentration, foreign ownership, new technology (for example, the growth of digital information storage and delivery), fashion changes, evolutions of costs, physical barriers to expansion (space or labour), congestion costs et al. The growing transition towards the knowledge-based industries will undoubtedly lead to considerable changes in the dynamics of the labour market. This will manifest itself in an increasing demand for trained personnel to fulfil R&D, product development and business development functions. Thus, London will be affected by:

- increased rates of technological change that will transform markets, revolutionise information and communications; and

- new employment patterns with an increasing proportion of employment within smaller companies, the rise in knowledge workers and more flexible labour markets.

The London Plan states "*one of the main drivers of future economic change is likely to be the link between competitiveness and human capital in the knowledge-based economy*". The London Plan also recognises that the impact of new technology could exacerbate the digital divide. Londoners will become increasingly affected by E-tailing, e-commerce and e-government. This will place increasing demands on workers to accommodate the changing nature of the workplace. However IT will also provide increasing flexibility for the workers in the labour market as their home and work environments become more substitutable. Changing patterns of journey-to-work may well arise and need to be addressed in the context of the future transport network.

Crucially, high-level skills (above NVQ 3) will necessitate continued high levels of resources for education and training. Failure to fund the training of the workforce would place economic growth at risk and affect employment levels.

Social justice

The increasing disparity in wealth and other quality of life measures between the poorest sections of society and the wealthiest is a key concern of the London Plan. Despite the strength of its economy London shows high levels of unemployment, worklessness and child poverty compared with other parts of the UK. Furthermore, these indicators are substantially higher in black and ethnic minority communities. Policies to address the resulting economic, housing and social issues run throughout the London Plan. However, in our view it would be inappropriate to use social and economic polarity as a dimension along which to develop scenarios and that these issues are best dealt with by considering the impacts of variations in the key socio-economic drivers, population and economy, on the prospects for the Plan's policies bringing about improvements.

C. Models

The study used a set of models run by the consultants and by staff at GLA and TfL, relating to four topics:

i) population/households
ii) employment
iii) transport, and
iv) environment.

The population and employment models were used to derive the levels and distribution of households and jobs in the scenarios themselves, while all four sets of models were used to derive output needed to test the performance of the London Plan under the four scenarios. It is important to bear in mind, however, that there was limited, if any, interaction between the outputs of the various models.

The levels and distributions of population and jobs for each scenario were utilised by TfL's modellers to assess how well each of two network investment plans (Baseline Case and London Plan Case) might cope with them. GLA's Economy and Environment (Enviros) Model was used to test the environmental impacts of the population, jobs and transport outcomes.

D. Policy Impact Analysis

A key aim of the study was to identify which policies of the London Plan – if any - may be at risk of underperforming against the Plan's key objectives under the range of scenarios described above. The London Plan's six broad objectives are:

1. To accommodate London's growth within its boundaries without encroaching on open spaces
2. To make London a better city for people to live in
3. To make London a more prosperous city with strong and diverse economic growth
4. To promote social inclusion and tackle deprivation and discrimination
5. To improve London's accessibility
6. To make London a more attractive, well-designed and green city

Each objective encompasses a set of performance measures and targets for use in monitoring the London Plan. The objectives can be linked to the various London Plan policies that are intended to achieve them. Particular policies can thus be identified as being vulnerable under a scenario if there is found to be a strong risk of their targets not being met when the relevant model outputs are tested against the performance measures.

We undertook a systematic assessment of the performance of the London Plan policies relative to the Baseline Scenario under the conditions that would prevail if the "Lower Growth", "Higher Growth" and "Spatially Constrained" scenarios were to apply over the period to 2026. The performances of the Plan policies were assessed under each scenario against all the London Plan objectives and their constituent performance measures and targets to the extent that this was possible using the outputs available from the model runs. Few model outputs were able to measure directly whether targets would be achieved under a scenario, but in many cases available outputs could be used to make an indirect assessment.

Objective 1 Accommodate Growth

This objective aims to ensure the space available for London's development is used efficiently by:

- Increasing the proportion of development on previously developed land
- Increasing the density of residential development
- Protecting open space

The most substantial demand on London's limited land resource is from housing. Increases in the number of net additional homes required under higher growth scenarios place greater pressure on land offering lower financial returns, particularly for community uses such as open space. Greater efforts become necessary to raise densities so as to channel residential development into the limited space identified as suitable for housing without threatening the provision of adequate support facilities. Conversely, lower increases in housing requirements are significantly easier to handle. With increasing densities, residential quality becomes a particular concern. As the Alterations recognise, this includes provision for amenity, social, health and environmental infrastructure as well as design and space standards. Associated improvements to open space provision will also help mitigate the external costs of climate change generated by higher growth. Redundant industrial land is one of the main sources of previously developed land available for transfer to housing. The need to release additional industrial land (relative to the Baseline Scenario) for a higher housing requirement is likely to conflict with the need to retain more of such land for employment and other purposes such as waste management. At the same time, developments to accommodate further office jobs, for which capacity has been identified, will take up space on highly accessible, mixed-use sites which might otherwise have helped offset the shortfall in residential capacity.

Substantially higher levels of population than currently envisaged would require residential development densities that may not be achievable and would thus pose a major challenge to the capacity of London to accommodate them. Though the structural effects of climate change are unlikely to be felt fully within the term of the Alterations, the Environment Agency has highlighted potential risks to realisation of some elements of the housing targets, especially in the Thames Gateway. The Plan outlines measures to address these. Further research is exploring their cost/growth implications.

Objective 2 Better City to Live In

This objective is aimed at ensuring an increasing supply of new and, particularly, affordable homes.

Because of the difficulties they face in accommodating sufficient housing on the available land, higher population and job growth scenarios pose significant risks to an adequate delivery of housing, including affordable housing. In practice, this would in dynamic terms tend to limit population growth by discouraging in-migration and encouraging out-migration.

Where higher growth in population than in jobs leads to a looser labour market, housing delivery may also be held back, as insufficient jobs relative to the working population may undermine demand for housing, particularly in east London, where the largest increases in housing and population are planned. This would be

particularly marked if the distribution of new office jobs to the growth areas failed to reach proposed levels.

There is a significant risk that capacity constraints and crowding on the transport networks would also undermine housing delivery, and hence affordable housing delivery, in the worst affected areas under any scenario, as this would affect occupier demand and developer confidence. Given the lack of spare housing capacity across London, this would affect the overall delivery in London.

Though strong growth is likely to generate, in total, more carbon outputs than low growth, it provides greater opportunities to address the costs of climate change and to reduce per capita contributions to carbon emissions. Similarly, it provides greater opportunities to address the externalities associated with the social exclusion/justice and new technology drivers of change, and resonates more closely with the aspirations associated with London's changing lifestyles and values.

Objective 3 More Prosperous City

There are three principal aspects to this Objective:

- Increasing sustainability of social inclusion by increasing the proportion of residents working in London
- Ensuring there is sufficient development capacity in the office market
- Encouraging economic and population growth to follow sub-regional guidelines

Although business space does not appear to be a significant constraint on job numbers over the job ranges investigated, a constraint could arise from competition from housing demand under higher growth scenarios. Whilst increased business densities could in principle facilitate this, the consequential higher land prices could also reduce London's competitiveness or, more probably, price some land-intensive jobs away.

The willingness of firms to move to and expand in east London is affected by the growth that can be achieved in the historic employment areas of London, particularly the Central Activities Zone (CAZ). Policy seeks to strike a delicate balance between encouraging CAZ development, which will spin-off jobs elsewhere, and at the same time making provision for eastward expansion. In this context, the greater the aggregate job growth the more likely it is that the eastward growth of London jobs will occur. This geographical pattern bears on the most distinct spatial expressions of climate change – the heat island effect associated with CAZ and flood risk in the Thames Gateway. The Plan anticipates addressing both through a range of measures including specific supplementary planning guidance. These measures are essentially long term. Recent extreme weather events have already demonstrated that London can expect additional and more immediate costs as a result of climate change. To address this high growth provides a better opportunity than low growth.

The push from historic employment areas would be greatly assisted by a suitable extension of the transport network. There is, however, a risk that if 'spare' employment capacity exists in historic areas, improved accessibility to the east may attract workers from there to the historic areas rather than attract jobs from the historic area to the east. The timing of transport delivery and capacity tightness in historic areas could be important to the success of an eastward shift in job locations.

The principal influence on labour participation rates assessed in this study is tightness of the labour market. Participation in employment is likely to increase when there is a tight labour market but the extent to which this can arise depends on equilibrating forces at work in the London economy. In our scenarios, labour markets are tighter under lower than higher growth scenarios because the potential range of population is greater than that of jobs. However, policies that focus on removing the impediments to work for specific social groups (e.g. women, disabled, BME groups), such as welfare to work programmes, are better suited to raising participation rates than land use policies conventionally associated with traditional development plans..

If historic trends continue, parts of suburban London might experience little or no employment growth. This could be exacerbated under a low growth scenario Suburban population growth[2] and improved access to the regional labour market as a whole offer particular potential to address this, together with the more specific measures outlined in the London Plan e.g. consolidation of the suburban office market. These are likely to be more effective drivers of suburban regeneration under a high growth scenario.

Objective 4 Social Inclusion

This Objective includes the following components:

- Increasing employment opportunities for the disadvantaged
- Improving performance against Neighbourhood Renewal floor targets.

The difficulties of relating broader economic changes to narrow social groups on the one hand and to wider social issues, such as health and education, limit useful comment on their consequences for social inclusion. However some social impacts flow more directly from the employment changes. For example, more buoyant labour markets tend to raise the employment prospects of socially excluded groups, although not necessarily by enough to reduce the gap between employment prospects of these groups and the populations as a whole.

Where there is greater pressure on land from housing, under the higher growth scenarios, the achievement of floor targets under Neighbourhood Renewal schemes may become more difficult to achieve. Pressure on space may make it harder to engineer spatial solutions in otherwise unattractive neighbourhoods. On the other hand, the greater rate of housing new-build and conversions implied by the higher population growth scenarios may create more opportunities that Neighbourhood Renewal schemes could exploit, for example to address security and safety issues. Higher economic growth is also more likely to provide greater opportunities to address the social exclusion dimensions to climate change e.g. the emergence of 'cool poverty', or the health consequences of higher temperatures which bear on particular groups.

Objective 5 Improve Accessibility

This Objective encompasses three core components:

- Reducing the private car share of total trips in London;

[2] GLAeconomics. More residents, more jobs? The relationship between population, employment and accessibility in London. GLA, 2005

- Increasing public transport capacity
- Facilitating growth in Opportunity and Intensification Areas

The ability to both facilitate and accommodate growth – particularly in the Higher Growth and Spatially Constrained Scenarios– will be detrimentally affected in the absence of substantial increases in public transport capacity.

The successful attainment of Objective 5 requires a sustained level of public transport investment over the next 20 years. This can only be attained by local and central government (together with private sector investment partially arising out of development gain and the provision of network services) providing sufficient levels of political support and funding. Indeed, it is apparent that major schemes such as Crossrail and LUL upgrading are required to ensure that the Baseline Scenario households and employment can be fully accommodated. In any higher growth scenario, public transport investment above the Baseline Case will be required in order to achieve the accessibility objectives and address those tackling climate change that bear on the transport system.

Whilst it is evident that the more prosperous London becomes the greater its ability to provide funding for the public transport funding, Objective 5 facilitates the other Objectives rather than the other way round. Failure to provide the required levels of transport investment would not only prejudice Objective 5 but also all the other London Plan Objectives. Objectives such as increasing levels of new homes, accommodating growth, directing growth to follow sub-regional allocations (particularly in east London), generating employment in opportunity/intensification areas, reducing CO2 emissions will only be met if the public transport network is expanded within the LP timetable in the appropriate sub-regions.

Objective 6 More Attractive, Well-Designed and Green City

This objective is aimed at maintaining and improving the environment of Londoners and curtailing the environmental impact of London on the rest of the world, by:

- Protecting biodiversity and cultural heritage
- Increasing the amount of waste recycled and managed
- Reducing greenhouse gas emissions
    - Improving energy efficiency and increasing the proportion of energy used generated from renewable sources, and
- Ensuring sustainable flood management

Most of the policy vulnerabilities in relation to this objective arise under the higher growth scenarios.

Biodiversity

Under higher growth scenarios, the greater levels and intensities of development for both housing and employment uses could have adverse impacts on biodiversity by reducing the amount and continuity of open land within the built-up area, particularly private gardens.

Waste

Under higher growth scenarios, sites for additional waste management facilities will probably need to be found within London, normally on land previously in

employment use. However, such land would be under substantial pressure to accommodate further housing requirements at the same time as higher employment levels would be restricting its release for any non-employment uses.

CO_2 emissions

Higher than envisaged population and employment scenarios could threaten the achievement of the London Plan's percentage reduction targets for CO_2 emissions, although the generation of higher levels of emissions under higher growth scenarios might trigger a demand for and acceptance of more stringent measures to control emission levels.

Flood management

Higher population scenarios place greater pressure to accommodate more new housing on land liable to flooding, particularly in the Thames Gateway. As well as threatening to reduce the area of functioning flood plains, more intensive development in these areas would tend to increase surface run-off. In the context of rising sea levels caused by global warming the costs of responding to such additional pressures on existing and new drainage systems in East London could potentially reduce the attractiveness of the area to developers, new residents and businesses. Research is currently underway to provide further detail on the specific costs of mitigating and adapting to climate change.

E. Managing Risks to the London Plan

Approach to Policy Risk

The study was aimed at establishing whether the policies of the Revised London Plan are sufficiently robust to allow the Plan to respond effectively to a realistic range of future conditions that may be substantially different from those under which it is currently assumed to operate. By considering the potential impacts on the Plan's performance under several scenarios, the study has drawn attention to a number of risks to the effectiveness of the Plan's policies in dealing with a range of challenges facing London in its development over the long term, particularly under higher growth scenarios

Some significant risks to the achievement of Plan objectives relate to the delivery of elements of the Plan itself. Even under the Baseline Scenario, potential failure of the Mayor's transport and environmental strategies and housing targets, for example, to achieve their intended outcomes clearly represents a first level of risk faced by the London Plan.

The present study was more concerned with the risks that might arise if future conditions were to turn out to be significantly different from those currently envisaged. The main risks presented by the different growth scenarios relate to constraints on capacity, particularly of land and infrastructure, to accommodate additional growth, and the possible mismatch between development pressures and available capacity, which may not support the wider objectives of the Plan. Specific work is already underway to assess the risks posed by climate change.

We concluded that none of the risks identified in this study are such as to justify immediate change to the content of the London Plan and that the Plan, Monitor and Manage approach it adopts is the most appropriate way of dealing with them. We

therefore explored potential improvements that could usefully be made to the procedures by which the Plan is implemented, monitored and reviewed.

Monitoring Improvements

The study has indicated that a proper understanding of the implications of trends in important contextual variables is critical to judging whether the Plan is likely to continue to deliver good performance against its objectives in the longer term and to give warning of policy failures or weaknesses that may require amendments or readjustments to the Plan. There is therefore a need to monitor, not just the current values of indicators, but also the results of projections reflecting changing trends, in order to foresee their potential impacts and decide how to respond to them.

This aspect of monitoring places substantial demands on the modelling capability available to the GLA. The GLA uses a number of demographic, economic, transport, environmental and other models that have been independently developed for separate and specific purposes and the models do not always work well together. These need to be organised and modified to allow easier and more effective iteration between them.

One critical issue identified in the present study is how to reconcile the multiple demands placed on London's limited land resources in the face of an inevitably uncertain future. This has major implications for key policy areas, including land allocations for different uses and the densities at which they should be developed. Reconciliation studies are needed to confirm the Plan can accommodate the Baseline Scenario's space requirements of housing, employment and other key uses of urban land, especially community facilities and open space. It would be desirable to incorporate these assessments within a single flexible model, ideally GIS based, that could assess the adequacy of land and density provisions to accommodate different levels of jobs, houses and facilities. This should take into account the costs of measures to mitigate and adapt to climate change.

1 INTRODUCTION

1.1 Appointment

Berkeley Hanover Consulting (BHC) - in association with Bone Wells Associates (BWA) and Michael Ling – submitted proposals for the First Review of the London Plan: Scenario Development and Policy Testing Project in early December 2005. We received confirmation of our appointment on 14th December and an inception meeting took place between the Client and the key members of the consultancy team on 29th December.

1.2 Purpose of Study

The London Plan published in 2004 contained a commitment to undertake 'an early review'. As part of that review, which will also extend the Plan to 2026, the GLA commissioned this research to consider a number of key areas where revised policy may be required in the context of potential change.

The objectives of the Study were:

a) To develop, refine and justify a set of broad scenarios illustrating possible future London circumstances; and

b) To test the robustness of the London Plan's objectives and key polices in the light of the scenarios, identifying those objectives and key policies which may be at risk in the light of changes to the main drivers of change.

The Terms of Reference for the study suggested the scenarios might comprise a Baseline, representing the London Plan, and High and Low Scenarios taking account of variations in population, economic growth and transport investment. The study was expected to use existing data together with data output from a number of models to be run by GLA and TfL using input data from the scenarios specified by the consultant.

1.3 Format of Report

Chapter 2 provides an overview of the consultants' approach to the research. Chapter 3 covers the generation of a range of scenarios and the selection of a limited number for analysis in the study.

Chapter 4 provides an in-depth analysis of the performance of the London Plan under each variant scenario from the individual perspectives of the six London Plan objectives– using the London Plan Baseline scenario as a point of comparison. The results in Chapter 4 focus on individual policy robustness and vulnerability assuming related policy influences and outcomes are unaffected. In Chapter 5, we consider the performance of the London Plan policies under the variant scenarios on an interactive basis and discuss how the risks to the London Plan can be managed.

The main report is supported by a set of Appendices. Appendix A sets out the conceptual framework within which we have built and analysed the scenarios used in the study, establishing a qualitative model of growth linkages in London and the key sources of risk affecting the potential achievement of London Plan objectives. Appendix B sets out the modelling methods and main input assumptions used to develop the scenarios and the key output data generated and used to test them. Assumptions and output relate to: population, jobs, transport and environmental

conditions. Appendix C links the London Plan objectives and policies and the measures by which their performance can be tested to the relevant model outputs available for the current assessment. Appendix D sets out the basis for the baseline demographic assumptions and the variations on them considered in the study. Appendix E discusses the importance of climate change for the future of London and how it is dealt with in the London Plan Review.

1.4 Acknowledgments

This report could not have been completed without the sustained assistance of a large number of officers at the GLA and TfL. The consultancy team wish to acknowledge this help but would emphasise that the report represents the views of the consultants and not necessarily the views of the GLA and TfL. Where the consultants have been dependent upon key inputs from the GLA and/or TfL, this is identified in the text.

2. STUDY APPROACH

2.1 Scenario Development

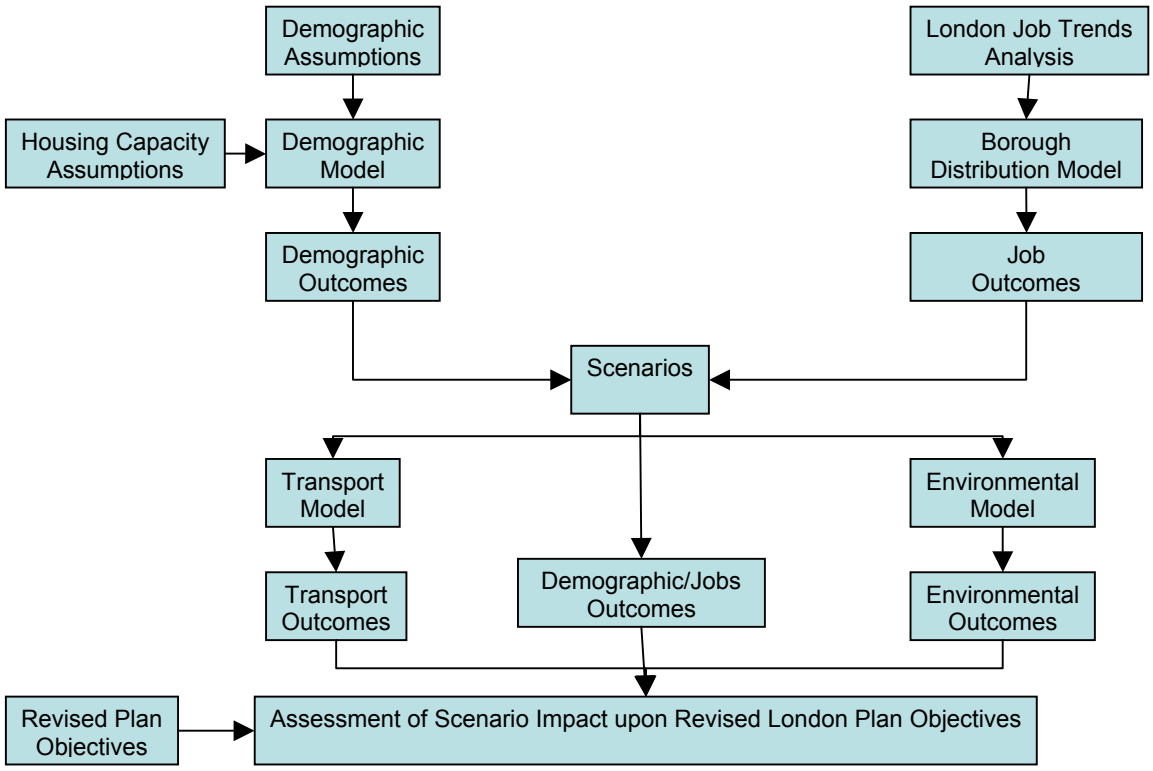
The process of building and selecting scenarios for analysis in the study is described fully in Chapter 3 and the underlying conceptual framework for scenario development is set out in Appendix A.

Starting from a Baseline Scenario that represents the most likely condition and the one that has been assumed in devising the London Plan policies, we generated three variant scenarios based on the range of outcomes from independent projections of population and jobs, which are considered to be the principal drivers of change. For each of these two drivers, an upper and a lower level were chosen around the baseline levels for population and jobs. "Higher Growth" and "Lower Growth" scenarios were then generated based on combining the upper levels of employment and population growth and the lower levels, respectively. A fourth "Spatially Constrained" Scenario was also developed, using the high population and job levels from the Higher Growth Scenario.

2.2 Modelling Overview

The study involved the consultants and staff at GLA and TfL undertaking modelling in four discrete areas, namely (i) population/households, (ii) employment, (iii) transport, and (iv) environment. These modelling exercises are described in some detail in Appendix B and their interconnections are presented graphically in Figure 2.1. The models were used to derive output required to test the London Plan against the four scenarios and in the case of the population and employment modelling to derive the scenarios themselves, as described above.

Figure 2.1 Linkages of Scenarios, Models and Assessments



The transport modelling for this exercise was undertaken by TfL. In effect, the aim of transport modelling is to provide a strategic examination on the aggregated impact of numerous transport improvements in London based on 2 possible transport investment scenarios.

The main outputs of the transport modelling were designed to measure (i) the additional capacity provided by the transport improvements; (ii) the impact on crowding levels; and (iii) improvements in accessibility. The models are computer based representations of conditions and contingent upon factors at specific points in time – the key ones being (i) the growth in number of jobs in London and the number of people living in London and the surrounding area; and (ii) the existing and future transport system.

A number of transport investment scenarios were discussed with TfL and GLA. The two transport scenarios used in this exercise are (i) the Baseline Case (BC) and (ii) London Plan Case (LPC) and are discussed further in Chapter 3.

In order to test a number of environmental policies in the London Plan, it was agreed that the GLA would run their Economy-Environment Model, which was developed for GLA in 2003 by Enviros Consulting Ltd. This is a linear model which uses a set of coefficients and emission factors to translate parameters of economic activity into a range of indicators of environmental and health outcomes. Economic activity is defined by population, employment and tourism levels, and the environmental impacts the model is capable of projecting relate to noise, air emissions, waste arisings, land use change, water discharges and water consumption. The model could be run using the population and employment outputs described above as well as the transport model outputs.

It is important to bear in mind that there is limited, if any, interaction between the outputs of the various models. The population and employment models are independent of each other and neither is constrained by the outputs of the transport modelling. Both the Environments model and the transport modelling are dependent on the outputs from the population and employment exercises and the Environment model is also partially dependent on the outputs of the transport modelling. A fully interactive model would have been too complex to build. Considerable judgement is, therefore, required in assessing the implications for policy and no more weight should be placed on projected scenario values than is placed in the text.

2.3 Policy Impact Analysis Overview

This research has attempted (i) to develop a range of possible future contexts (scenarios) for the development of London within which the London Plan may plausibly need to operate and (ii) to identify which of its policies, if any, may be at risk of underperforming against the objectives of the plan. The linkages between the London Plan objectives and the policies aimed at achieving them are discussed in Appendix C.

The aim of the policy impact analysis was to identify which policies of the London Plan – if any - may be at risk of underperforming against the Plan's key objectives under the range of scenarios described above. The London Plan's six broad objectives are:

1. To accommodate London's growth within its boundaries without encroaching on open spaces

2. To make London a better city for people to live in
3. To make London a more prosperous city with strong and diverse economic growth
4. To promote social inclusion and tackle deprivation and discrimination
5. To improve London's accessibility
6. To make London a more attractive, well-designed and green city

Each objective encompasses a set of performance measures and targets for use in monitoring the London Plan. The full list of objectives, measures and targets is set out in Table C.1 of Appendix C, together with relevant extracts from the London Plan policies, which are intended to achieve them. These are the policies that will be identified as being vulnerable if there is found to be a strong risk of a target not being met when the relevant model outputs are tested against the performance measures, under a particular scenario.

We undertook a systematic assessment of the performance of the London Plan policies under the conditions that would prevail if the "Lower Growth", "Higher Growth" and "Spatially Constrained" scenarios were to apply over the period to 2026. The performances of the Plan policies are assessed under each scenario against all the London Plan objectives and their constituent performance measures and targets, to the extent that this is possible given the outputs available from the model runs that could be undertaken within the resources and time constraints of the study. The results of this analysis are described in detail in Chapter 4.

In assessing the performance of the London Plan under the various scenarios we have been dependent on the capacity of the available models to generate output in a suitable form. There are few model outputs that can directly measure whether targets would be achieved under a scenario but in many cases available outputs can be used to make an indirect assessment.

2.4 Consultation

Following the publication of (i) the Mayor's *Statement of Intent* that set out the agenda for this Review of the London Plan; and (ii) the GLA report *Our London. Our Future* which set out the initial evidence base underlying the Review of the London Plan, we contacted 17 key stakeholders in January 2006 concerning this exercise. We specifically asked the following questions:

(i) What do you regard as the critical uncertainties and risks that affect the delivery of the London Plan in the specific areas of specialisation that your organisation is concerned with, and which specifically should the aforementioned scenario exercise take into consideration?

*(ii) Are there any particular (approximate) quantitative levels for thresholds/trigger points that your organisation has identified where particular **major** problems emerge, capacities are exhausted and/or particular major infrastructure or investment becomes necessary, either at the whole London level or at the sub-regional level – for example population thresholds?*

(iii) Are there any other qualitative or quantitative effects of growth in the specific areas of specialisation that your organisation deals with which you wish to draw attention to as either beneficial or undesirable, easy or difficult to

manage, and how might these vary were growth to be higher or lower than anticipated in the existing London Plan?

(iv) If appropriate, what are the time horizons and key growth assumptions underlying your organisation's long term forecasting and planning?

(v) Are there any other points you want to make in the context of high level scenarios for the first review of the London Plan?

We received replies from the following organisations - NHS London Healthy Urban Development Unit, The London Forum of Civic and Amenity Societies, The Environment Agency and the CBI.

Given the limited response, it is not possible to discern any common concerns and/or comments. Nevertheless, key concerns highlighted included the delivery of major transport infrastructure and the impacts of high demographic growth upon the environment, biodiversity and the adequacy of health service provision.

2.5 **Client Liaison**

In addition to the support of a number of GLA technical officers during the course of the research and the modelling exercises, several meetings were held with those officers directly concerned the proposed alterations to the London Plan. On a number of occasions, it was necessarily to agree (and revise) important parameters to this research. Furthermore, a strategy meeting took place between officers of GLA/TfL and the consultants in late January 2006 to ensure that the process of the research was congruent with the 'high level' views of senior GLA officers.

3. SCENARIO DEVELOPMENT

3.1 Purpose of Scenarios

The reason for constructing scenarios in this study is to test the robustness of the objectives and key policies of the London Plan. Scenarios explore possible alternative futures for the conditions under which the London Plan may need to operate, key relevant variables being the scale and spatial distribution of population, households and jobs.

London's population and economy form a complex social and economic system, with a set of internal relationships, internally generated trends, and susceptibility to a range of external forces. This system could, in principle, be modelled to generate alternative futures, by making assumptions about how the internal trends and parameters alter as different external forces change. The construction of such a model would, however, be a major and costly undertaking and there would be no certainty that the results would be adequate as a simulation of what might happen in the real world. The internal system is itself complex and full of feedback loops. Parts of it could be modelled by established procedures using partial models that are not integrated and are without feedback loops. The GLA has adopted this latter approach, which we have followed.

Given the broad focus of the London Plan, the huge variability in external conditions that might be considered and the gross uncertainties about how they could impact on London it is impractical to devise scenarios reflecting responses to specific changes in external conditions. The approach we have adopted, therefore, is to build scenarios which represent the plausible range of outcomes for the key variables affecting the future of London: population change, job growth and centrally funded transport infrastructure, as envisaged by the Terms of Reference for the Study. It is then possible to speculate about some of the internal and external conditions that might give rise to these outcomes

It should be understood that under this approach the long term scenarios are not intended to represent forecasts of particular, more or less likely, futures but to serve as helpful tools for understanding which threats planners need to be looking out for and responding to. The scenarios explore the direction in which current trends and policies may be driving the city's development. As with most projections in planning the aim is to understand where trends are heading in order to be able to avoid or mitigate their undesirable consequences, by monitoring change and adjusting the plan.

3.2 Scenario Dimensions

We have based our scenarios on the range of outcomes from independent projections of population and jobs, which are considered to be the principal drivers of change. For each of these two drivers we have started from a Baseline projection that represents the most likely condition and the one that has been assumed in devising the London Plan policies. Around these baseline levels for population and jobs, an upper and a lower level have been chosen for each, to represent a plausible range of values.

3.2.1 Population scenarios

The GLA's Data Management and Analysis Group's (DMAG) have prepared three updated unconstrained population projections (high, central and low), reflecting the high and low variants for international migration and fertility rates used in the most recent Government Actuary Department's (GAD) 2004-based UK population projections as they might apply to London. These represent an official up to date view of the reasonable range for these variables over the long term. In practice population levels are constrained by housing supply and the scenarios for the present study were developed using assumptions about housing capacity/delivery from the London Housing Capacity Study, and household size.

Using the DMAG's spreadsheet model we generated a total of eight scenarios by varying housing delivery and household size assumptions, as shown in Table D.3 in Appendix D. A principal reason for generating a relatively large number of population scenarios was to explore how sensitive population outcomes might be. While this was not exhaustive, a number of scenarios tended to cluster around the lower end and baseline, with only one at the higher end. It was therefore felt that selecting the lowest and highest populations, in addition to the baseline, produced both a representative set and a reasonable range. The distribution of population to Boroughs was determined by the distribution of housing capacity under the associated London Housing Capacity Study scenario.

The Baseline or London Plan scenario assumes dwelling numbers will be delivered at Scenario D level from the London Housing Capacity Study, while average household size falls to 2.269. The characteristics of the scenarios at the upper and lower ends of the plausible range are shown in Table 3.1

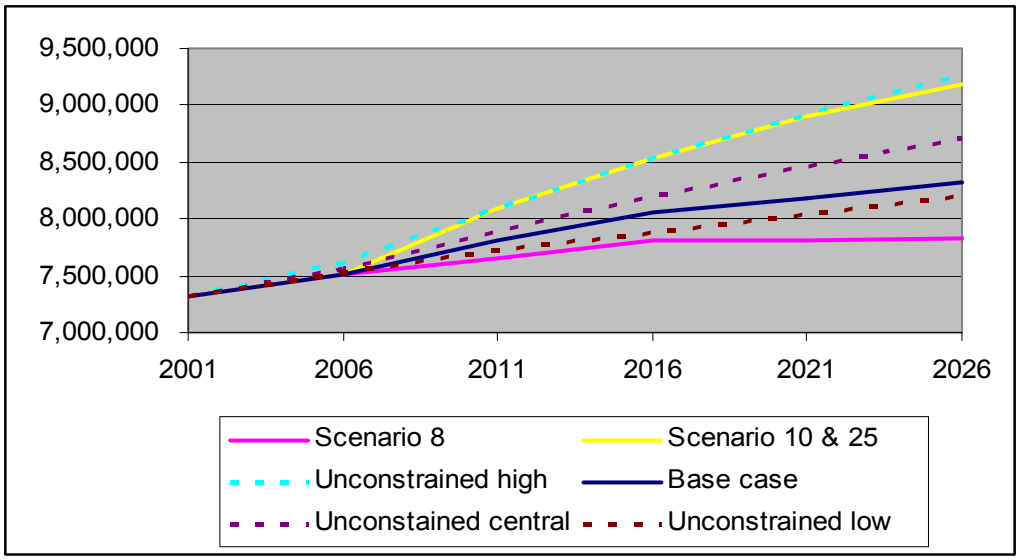
Table 3.1 Population, housing and household size parameters of adopted population scenarios

Scenario	**Population level**	**Housing capacity**	**Household size**
High Scenario	Up to 2021 assumes unconstrained high projection (net international migration and fertility rates factored up to match GAD UK 2004-based high variants); From 2021 population capped to limit household size to 2001 level in 2021 and 2026 (i.e. population is the outcome of housing capacity / delivery and the household size assumption)	LHCS Scenario F capacity of 40,684 dwellings p.a. 2006/7 to 2016/17, and equivalent post 2016/17	Household size is outcome of unconstrained population level and assumed housing capacity, up to 2021 when it reaches the 2001 level of 2.38 (which is an input assumption in 2021 and 2026)
Low Scenario	Population is constrained by housing capacity and assumed household size (i.e. throughout the period, population is the outcome of housing capacity/delivery and the household size assumption)	LHCS baseline capacity of 31,090 dwellings p.a. 2006/7 to 2016/17 (LHCS Scenario D)	Follows ODPM 2003 based projection of average household size for London (2.13 by 2026) as an input assumption.

The resulting population projections for Greater London are shown in Figure 1, with the unconstrained projections shown for comparison in dotted lines. From this it can be seen that:

- The Baseline is between the central and low unconstrained projections, and nearer the latter after 2016;
- The High Scenario matches the high unconstrained case up to 2021;
- The Low Scenario is below the unconstrained low case, particularly after 2016 when there is very little growth, the fall in household size offsetting the increase in the housing stock.

Figure 3.1 Greater London Total Population Projection Ranges



The higher population growth projection assumes that London takes its share (based on recent averages) of the assumed high variant level of net international migration to the UK in the Government Actuary's Department's (GAD) 2004-based projections of the UK population[1]. This assumes a net in-migration level of 205,000 p.a. from 2007-08 onwards. This compares with the official estimate of international migration in 2004, the latest year for which official figures are available, of 222,600, and a five-year average (2000 to 2004) of 172,000. The levels since 2004 are likely to be higher due to migration from new members of the EU. The high assumption is therefore not exceptional in relation to recent experience. The high projection also assumes fertility rates for London consistent with the high variant rate in the GAD projections.

The lower growth population projection on the other hand responds to strong socio-economic and demographic forces leading to falling household size. These include the ageing of the population (less predominant in London that in the country as a whole), lifestyle choices towards living alone, increasing incomes, and family breakdown. The ODPM household projections have estimated the impact of these forces on London. If reduced population growth pressures and housing market conditions allow these socio-economic factors to predominate, the revised plan housing capacity will accommodate a population significantly below the baseline projection. This might occur if controls over international migration increased, EU

[1] The Government Actuary's Department 2004-based population for the United Kingdom looked at two variants around a principal assumption for international migration. The principal projection assumed annual net international migration of 145,000 from 2007-08 onwards, a figure exceeded in the official estimates every year since 1999 to 2004, the latest year for which figures, which do not fully reflect illegal migration or overstayers, are available.

expansion stalled and/or the relative prosperity, job opportunities and quality of life in origin countries and UK regions improved, for example, encouraging eastern European migrants to return home.

3.2.2 Jobs scenarios

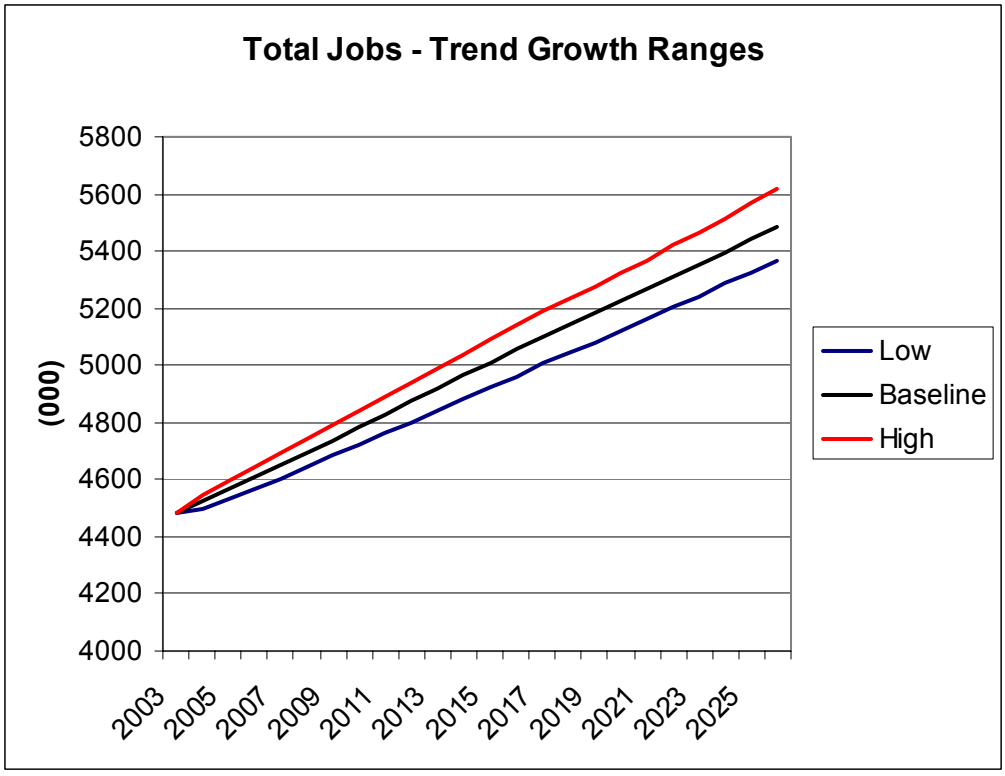
Total jobs

The sectoral and total jobs figures for the revised London Plan are based on forecasts prepared for the GLA by Volterra. Their baseline London-wide job projections, as adopted as assumptions underlying the London Plan, use trend analysis and depend on the following assumptions:

- continuation of employment/GVA growth at the same rates as selected past periods;
- future growth of London's real GVA, which was taken at 2.5%.

We used the same approach to develop scenarios at the upper and lower end of a plausible range. Volterra provided us with the statistical margin of error around their baseline sectoral growth rates (see Table 3.2). The low and high trends in jobs created were simulated on a probability basis using the statistical ranges provided by Volterra and assuming an annual GVA growth range of 2 to 3% with its own associated probability (a Monte Carlo technique). The resulting range around the baseline trend (see Figure 3.2) captured 90% of the likely variation in the trend.

Figure 3.2 Greater London Job Growth – High and Low Scenarios around the Baseline Trend



By 2026 the high job growth scenario has 130,000 more jobs than the Baseline while the low job growth Scenario has 117,000 fewer jobs. Does this represent a reasonable range? The London Plan Baseline is a trend and therefore accepts that actual jobs may well cycle above and below it either due to shocks or business cycles. The scenarios also represent trends and similarly accept that there will be variations around the trend. There could be a deep recession within the period to 2026 with declines in jobs but on past experience, analysed by Volterra from 1971, this will be followed by comparatively strong growth. What our scenarios explore is the scope for this variability to be consistent with a higher or lower trend rate of growth than is contained in the Baseline.

In the overall period assessed by Volterra there were contributions to that variability from a few major oil shocks, a number of major currency crises, a considerable variation in government fiscal and monetary policies, substantial reforms in capital and labour markets, major structural shifts in the industrial composition of UK output, the collapse of the Soviet economies, the rise of the Asian economies and so on. There is therefore no lack of considerable variation in economic conditions captured in the historical data that inform either the Baseline or the Scenario trends. The projected trend high and low trends around the Baseline are therefore reasonable and consistent with considerable economic variability,

Spatial distribution of jobs

A model was constructed to distribute projected London-wide jobs to boroughs under each employment scenario. For most sectors, the number of additional jobs was distributed according to the distribution in 2003. In other words, borough job numbers in these sectors changed at the projected London-wide rate for that sector to 2026. However, some sectors were treated differently. Additional retail jobs in Inner London boroughs were projected at the London-wide growth rate but for Outer London boroughs additional jobs were allocated to boroughs according to the distribution of projected population growth. Additional health and education jobs were also allocated according to the distribution of projected population growth. The distribution of retail, health and education jobs is therefore influenced by the population distributions emerging from the population scenarios, while the distribution of office jobs is affected by the relative availability of potential office sites.

Office jobs represent a major portion of the additional employment projected under each of the scenarios. Annual additional office jobs were distributed according to the proportion of London's spare office capacity to be found in a borough at the relevant date, using assessments of office capacity undertaken by Roger Tym & Partners for the GLA[2] (See section B.3.3 of Appendix B). The 2006 London Office Policy Review was published in June 2006[3]. This was too late for its findings to be incorporated into our assessments but, like the Roger Tym exercise, the Review report suggests that there is substantial office capacity available in London to meet long term demands.

The distribution method assumes that a borough that is well endowed with potential spare capacity would attract a relatively large proportion of the annual increase in

[2] London Employment Sites Database, Technical Note and Results, October 2005, Roger Tym & Partner.
[3] London Office Policy Review 2006, A Review of Office Market Trends 2004-2006 and Their Implications for Strategic Planning Policy, David Chippendale – Chippendale Consulting & Research Geoff Marsh – London Property Research, June 2006

London office jobs. Conversely a borough at or approaching its capacity limit would attract none or very little. The mechanism seeks to mimic, though imperfectly, the likely movement in office rents. Areas reaching their capacities would tend to have higher rents and not be able to increase supply, as a result pricing off demand. Boroughs with substantial potential office capacity would tend to have lower rents (placing lower residual values on land) and attract demand. The missing variables in this underlying argument are the relative cost and quality of transport links.

It may be questioned, however, whether this rationale will necessarily apply in areas where there is very little existing mass of office employment to which to attract further jobs. In particular, the latest assessments of sites with office potential identify substantial capacity in east London. The provision of new high capacity transport links to these areas need not necessarily make them more attractive as business locations but could rather allow their resident workers access to better paid jobs in the traditional office areas at an acceptable commuting cost. We considered the success of the policy of increasing employment in eastern parts of London to be a significant area of uncertainty that should be tested through the scenario testing process. We therefore developed a capacity limitation routine that could be applied to the distribution of employment to boroughs, thus generating potential further scenarios.

Under our job distribution method, relative availability of office capacity is used to distribute office jobs to particular boroughs. However, even for the highest job scenario there is still a considerable excess capacity so some boroughs have very low levels of office capacity utilisation. While most boroughs' capacity utilisation from 2003 to 2026 range between the upper 80 and 90%, five boroughs (Barking & Dagenham, Greenwich, Haringey, Newham and Tower Hamlets) have effective capacity utilisations that drift into the low 60% and from quite early in the period. While these low office utilisation rates have been allowed to stand in most scenarios, under a "capped" scenario the total capacity and its rate of growth over the period are reduced. This weakens both the rate at which these boroughs gain from the redistribution principle and the extent to which they gain.

3.3 Compiling and Choosing Scenarios for Testing

The population and job scenarios each encompassed a baseline and two variants (high and low). Combining the high, baseline and low scenarios for both population and jobs produces a total of nine scenarios. However, TfL had the time and capacity to test only four demographic/job scenarios (including the Baseline) for each of two transport provision scenarios (see below) using their transport models. In a paper provided to the Client in April 2006, we recommended that the most appropriate variant scenarios for testing the robustness of the London Plan should involve the combinations of (i) low end employment with low end population and (ii) high end employment with high end population, as envisaged by the Terms of Reference of the Study. The resulting "Higher Growth" and "Lower Growth" scenarios would be based on upper and lower levels of employment and population growth falling within acceptable forecast ranges. We reserved the fourth scenario for a variation in the distribution of office jobs, using the "capped" approach, This "Spatially Constrained" Scenario was combined with the high population and job levels from the Higher Growth Scenario. After discussions with the Client, the four recommended scenarios were accepted in May 2006.

The scenarios can be summarised as follows:

- Baseline: baseline population and baseline employment
- Lower Growth: lower population and lower employment
- Higher Growth: higher population and higher employment
- Higher Growth Spatially Constrained: a variant of the Higher Growth scenario, with office employment, distributed according to the capped approach.

It should be emphasised that the scenarios are described in terms of the variation from the baseline and not absolutely. Thus, the Lower Growth Scenario is not a "low growth" scenario in absolute terms. Table 3.2 shows the total population and job levels for each scenario at five year intervals from 2001 to 2026.

Table 3.2 Total population and jobs by Scenario

Year	Level ('000s)						Difference from Baseline ('000s)			
	Baseline		Lower Growth		Higher Growth		Lower Growth		Higher Growth	
	Pop	Jobs	Pop	Jobs	Pop	Jobs	Pop	Jobs	Pop	Jobs
2001	7322	4547	7322	4547	7322	4547	0	0	0	0
2006	7509	4603	7509	4557	7509	4639	0	-46	0	36
2011	7816	4816	7657	4753	8099	4881	-159	-63	283	65
2016	8050	5039	7806	4943	8535	5123	-244	-96	485	84
2021	8180	5240	7811	5140	8905	5343	-369	-100	725	103
2026	8328	5450	7819	5333	9174	5579	-509	-117	846	129

This selection resulted in the omission of high-low and low-high combinations of demographic and job projections from the final analysis. Doubtless there would have been some merit in exploring these further. However, bearing in mind the mutual dependence of the economically active and job creation discussed earlier, the difficulty in fully reconciling these within a changing policy context that impinges on commuting decisions, and the need to constrain the overall number of scenarios, we felt that the less conflictual scenarios would be more appropriate in the context of broad trend analysis. While it is not impossible for, say, a surge of migration into London to occur against a weak job creation background, various self correcting mechanisms would be likely to be come into action. For example, migrants would probably be less likely to continue coming to London if job opportunities were weak, while at the same time job creation might be stimulated by lower real wages resulting from the greater supply of labour.

The outcome in the short term of events that saw a surge in population, for example, might be quite painful. However, it is unlikely that it would endure for the 20 year horizon of this study. There would be pressure on housing, tending to raise housing costs at the same time that real wage growth might be rather weak. The social impact would probably be more severe for London's poorer residents and to the extent that this is spatially concentrated, worse for certain areas. There would be similar pressures on socially provided services such as health and education, with a similar likelihood that poorer communities might suffer more. Finally, there would be the 'safety valve' of increased out-commuting to work in regions outside London, though this would depend on the adequacy of the transport network and the prospects of neighbouring regions. A high population - low job scenario is unlikely to be a long term phenomenon and furthermore its shorter term dynamics are particularly difficult to capture adequately in an exercise of this scale and with the tools available.

The scenarios that were carried forward are nevertheless not without some of the stresses which characterise the more conflictual scenarios. Projected population levels change to a relatively greater extent between the Lower and Higher Growth Scenarios, than job levels. The different relative pressures on population and jobs imply changes in net commuting relative to the Baseline. London's economically active population does not necessarily equal the number of jobs in London. There is already considerable net commuting into London consistent with jobs exceeding London's economically active. However, the proportion of people economically active is not independent of the number of jobs available and the number of jobs firms are willing to create is not entirely independent of the supply of labour. Furthermore commuting patterns will also be affected by not only relative wages but also relative housing costs and commuting costs. Since the latter are affected by London Plan policies a quite complex modelling system beyond the scope of this exercise would be required to determine a reasonable equilibrium. For the purposes of this scenario exercise, it was assumed that net commuting would take the strain of the divergences between population and job projections.

3.4 Transport Scenarios

It was agreed that the transport modelling should be based upon two transport scenarios to represent the likely conditions based on funding and probability of project delivery. The scenarios are: (i) the Baseline Case and (ii) the London Plan Case. Thus the eventual Railplan modelling was intended to test these 2 transport scenarios against the baseline and variant scenarios 8 (Low), and 10 (High).

The capacity schemes in the two transport scenarios are shown below in Tables 3.3 and 3.4 together with indicative start dates for each project. However, it is important to consider the full range of transport investments and policy instruments planned in order to understand the transport impacts under each development scenario. The London Plan Case would include major infrastructural schemes, and a range of walking and cycling strategies and travel demand management measures. Initial work for the purpose of the London Plan Scenario work, the adopted strategy for RUC is a distance-based charging scheme with different charges imposed for Central, Inner and Outer London. This scheme would be supported by complementary measures and a series of travel demand measures.

The Baseline Case comprises Crossrail 1 and projects that have received funding and are certain to commence operations by 2011. The upgrading of a number of LUL lines/stations and the opening of the Thames Gateway Bridge is assumed for the period 2012 – 2021. Whilst not committed, Crossrail 1 is assumed to commence operations during the period 2017 – 2021.

Table 3.3 2026 Baseline Case (BC)

Scheme[4]	Completion Date	2006-2012	2012-2017	2017-2021	Post 2022
DLR - Woolwich Extension	2008				
White City Developments - New Station	2008				
East London Transit (Phase 1A: Ilford – Dagenham Dock)	2008				
Channel Tunnel Rail Link (International)	2007				
Channel Tunnel Rail Link (Domestic Services)	2009				
Greenwich Waterfront Transit (Phase 1: Abbey Wood – North Greenwich)	2009				
DLR: Bank - Lewisham 3 car upgrade	2009				
DLR: Stratford International	2010				
Bus Capacity increase across London – Short/Medium term	2010				
East London Line Extension - Dalston, Crystal Palace, West Croydon, & New Cross	2010				
Upgrade of Jubilee Line + Waterloo & City Line	2010				
Heathrow Express and Piccadilly Line Extension to T5	2011				
Stratford International & Regional station development	2011				
Upgrade of Northern, Hammersmith & City, Metropolitan, Circle, Piccadilly, Victoria plus Bank, Tottenham Court Road and Victoria stations	2011-2015				
Upgrade of District line	2016-2021				
Upgrade of Bakerloo line	2022				
Thames Gateway Bridge[5]	2013				
Crossrail 1[6]	2016				
Short-term Funded Improvements to Walking & Cycling	2006-2026				

Indicative Phasing

Source: Transport for London, April 2006

[4] Schemes are not ranked in order of priority.
[5] Currently subject to a planning inquiry.
[6] Schemes that are planned but not committed.

Table 3.4 London Plan Case (additional schemes to those in Table 3.4)

Scheme[7]	Completion Date	2006-2012	2012-2017	2017-2021	Post 2022
Thameslink Upgrade	2016				
East London Line Further Phases	2016				
West London Tram	2013				
Cross River Tram	2016				
NR: Airtrack	2026				
East London Transit Further Phases	2012-2021				
Greenwich Waterfront Transit Further Phases	2012-2021				
Croydon Tramlink Extension – Crystal Palace	2016				
Silvertown Link	2021				
DLR: Dagenham Dock Extension	2021				
Croydon Tramlink Further Phases	2026				
DLR: Charing Cross Extension	2026				
DLR: Lewisham – Catford Extension	2026				
LUL: Bakerloo Extension – Watford Junction[8]	2026				
LUL: Bakerloo Extension – Elephant & Castle, Hearne Hill, Camberwell, Tulse Hill	2026				
Croxley Link	2026				
Crossrail 2*					
Other National Rail Improvements	2006-2026				
Additional Bus Capacity Increase	2012-2026				
Additional Improvements to Walking & Cycling	2006-2026				
Maximise Available Capacity from Existing Network	2006-2026				
Policy Measures - Travel Demand Management	2006-2026				
Continuing work with National Government on their Road Pricing Feasibility Programme	2006-2026				

Indicative Phasing

* Crossrail 2 is currently excluded from the modelling.

Source: Transport for London, April 2006

[7] Schemes are not ranked in order of priority.
[8] Bakerloo Line Extension to Watford Junction and DC Conversion is part of North London Line Upgrade (Option 12)

3.5 Other London Plan Drivers

The London Plan identifies four other forces driving change in London. However, while these will have important implications for the future of London and the achievement of the London Plan objectives, they do not present a range of possible futures that are likely to have differential impacts on the spatial planning of the city.

3.5.1 Climate change

Climate change does not constitute a variable element for spatial planning in the same way as, for example, demographic, transport and economic change. There is a solid body of scientific evidence about the probable effects of climate change over the Plan period. Because of the effects already created in the past, there is relatively little prospect of strategic levels of variation. Moreover, the main potential for strategic variation would be political, corporate and personal behavioural change of massive dimensions - mainly in other continents- which is far removed from the spheres of influence of spatial planning for London. So the Mayor has to plan to adapt to the unavoidable and to mitigate its effects in so far as he is able to.

3.5.2 Lifestyles and values,

The London Plan identifies a move to a higher density, more urban, intensive, continental lifestyle, with less sharp separation of work and home. The changes in preferred working practices that this implies, supported by further developments in new technology, could have impacts on business location and transport demand. Concerns for higher personal safety in the face of increased security threats could also influence transport use and household location decisions. Such tendencies, however, are not considered to be potentially strong or distinctive enough to justify an exploration of their implications on plan policies through specific scenarios.

3.5.3 New Technology

Economic activity in London is subject to processes of transformation that will continue to come from a wide variety of sources - changes in market concentration, foreign ownership, new technology (for example, the growth of digital information storage and delivery), fashion changes, evolutions of costs, physical barriers to expansion (space or labour), congestion costs et al. The growing transition towards the knowledge-based industries will undoubtedly lead to considerable changes in the dynamics of the labour market. This will manifest itself in an increasing demand for trained personnel to fulfil R&D, product development and business development functions. Thus, London will be affected by:

- increased rates of technological change that will transform markets, revolutionise information and communications; and

- new employment patterns with an increasing proportion of employment within smaller companies, the rise in knowledge workers and more flexible labour markets.

The London Plan states "*one of the main drivers of future economic change is likely to be the link between competitiveness and human capital in the knowledge-based economy*". The London Plan also recognises that the impact of new technology could exacerbate the digital divide. Londoners will become increasingly affected by E-tailing, e-commerce and e-government. This will place increasing demands on workers to accommodate the changing nature of the workplace. However IT will also

provide increasing flexibility for the workers in the labour market as their home and work environments become more substitutable. Changing patterns of journey-to-work may well arise and need to be addressed in the context of the future transport network.

Crucially, high-level skills (above NVQ 3) will necessitate continued high levels of resources for education and training. Failure to fund the training of the workforce would place economic growth at risk and affect employment levels.

3.5.4 Social justice

The increasing disparity in wealth and other quality of life measures between the poorest sections of society and the wealthiest is a key concern of the London Plan. Despite the strength of its economy London shows high levels of unemployment, worklessness and child poverty compared with other parts of the UK. Furthermore, these indicators are substantially higher in black and ethnic minority communities. Policies to address the resulting economic, housing and social issues run throughout the London Plan. However, in our view it would be inappropriate to use social and economic polarity as a dimension along which to develop scenarios and that these issues are best dealt with by considering the impacts of variations in the key socio-economic drivers, population and economy, on the prospects for the Plan's policies bringing about improvements.

4 SCENARIO IMPACT ON LONDON PLAN POLICY OBJECTIVES

4.1 Introduction

Spatially Constrained Scenarios were to apply over the period to 2026. The assessment is informed by numerical outputs from the scenario exercise (see Appendix B) and a qualitative model of the London economy (see Appendix A).

The performances of the Plan policies are assessed under each scenario against all the London Plan objectives and their constituent performance measures and targets, to the extent that this is possible given the outputs available from the model runs that could be undertaken within the resources and time constraints of the study. Table C.2 in Appendix C noted that the models can produce outputs directly useful for measuring the potential achievement of objectives and targets in only a few cases but in many cases there are model outputs which can give an indirect indication of the relative performance of the Plan against a performance measure under different scenarios.

It should be borne in mind that the assessment against each objective/target is based on the simplifying assumption that all impacts are independent of each other, with no feedback mechanisms that would alter the conditions projected under the scenario. Thus, even if the assessment identifies major difficulties in relation to the performance of policies in terms of one measure, no assumption is made that this would lead to changes in, for example, behaviour or costs affecting performance against other measures. The interactions likely to arise between impacts against different performance measures within each Scenario and their consequences are discussed in Chapter 5.

The format of the chapter is as follows. For each Plan objective - in turn - the performance of the London Plan policies in meeting its aims and targets is considered for each Scenario and compared with performance under the Baseline Scenario. For each scenario there is initially a short summary table that presents the key conclusions reached upon the scenario's impacts on performance measures and targets for the objective in question and on the policies that might therefore be vulnerable under the scenario. The table is followed by a discussion in the text of the reasoning behind these conclusions and the evidence base for them.

4.2 Objective 1: Accommodate Growth

(i) Lower Growth Scenario

Table 4.1 Policy Objective 1: Accommodate Growth - Lower Growth Scenario

Conclusion on Scenario Impact	Policy Vulnerability
1: Increasing the proportion of development taking place on previously developed land	
No significant impact	No additional policy vulnerability
2: Increasing the density of residential development	
No significant impact	No additional policy vulnerability
3: Protection of open space	
No significant impact	No additional policy vulnerability

Proportion of development on PDL and protection of open space

The housing demands of the Lower Growth Scenario are the same as those of the Baseline Scenario so there would be no greater pressure on greenfield land (including open space) to accommodate new housing. (It should be noted, however, that even under the Baseline Scenario there are considerable uncertainties about the scale of housing capacity available after 2017.) Furthermore, under the Lower Growth Scenario there would be a slightly reduced requirement to accommodate office jobs and a slightly greater potential release of existing industrial land for other uses. The somewhat lower population would also reduce relatively the requirement for additional community facilities such as schools and open space. As well as easing pressure on greenfield land (including open space), the Lower Growth Scenario would make it somewhat easier to meet the targets for increasing the proportion of development on PDL.

Density of residential development

No appreciable impact.

As the Higher Growth and Spatially Constrained Scenarios have the same housing requirement and similar total space requirements for all uses, their impacts on the achievement of Objective 1 will be very similar.

(ii) Higher Growth and Spatially Constrained Scenarios

Table 4.2 Policy Objective 1: Accommodate Growth – Higher Growth and Spatially Constrained Scenarios

Conclusion on Scenario Impact	Policy Vulnerability
1: Increasing the proportion of development taking place on previously developed land	
Some pressure for development on greenfield land	• Major risk of not being able to accommodate housing required for population (Policy 3A.1)
2: Increasing the density of residential development	
Significantly higher average densities than in LP density matrix required and need to be implemented from an early date	• LP density matrix inadequate to generate housing required (Policy 3A.2) • Sufficiently high densities to accommodate housing required for population unlikely to be achievable (Policy 3A.1) • Intended quality of new housing provision may not be achieved in terms of meeting demand for larger family dwellings (Policy 3A.4i)
3: Protection of open space	
Considerable pressure for development on open space, including formal, informal and school playing fields, and pressure for more intensive recreational use of available open space to meet demands of higher population	• Likely to be very difficult to protect fully Green Belt, Metropolitan Open Land and Open Space from development pressures (Policies 3D.8, 9 and 10) • Difficult to realise full potential value of available open space due to need to accommodate additional active recreation (Policy 3D.7)

Proportion of development on PDL

The substantially higher population of the Higher Growth and Spatially Constrained Scenarios generates the need for up to 90,000 more dwellings by 2016 than are required under the Baseline Scenario (an increase of 30%), increasing to an additional 180,000 (nearly 40% more than the Baseline) by 2026. This will be very difficult to achieve. In order to accommodate such a level of development it would be necessary to adopt measures equivalent to those of London Housing Capacity Study (2004) Scenario F. These involve applying densities at the top end of the density matrix, releasing more of the industrial land protected for employment purposes by current Borough UDP policies and further increasing efforts to overcome a range of constraints on site development. It is

important to appreciate that the application of Scenario F measures needs to be commenced very early in the plan period if it is to have sufficient impact on potential housing numbers. Even if full achievement of the density matrix midpoints on large sites were to be achieved from day one, housing provision on these sites would contribute less than the amount required to realise the Higher Growth and Spatially Constrained Scenarios.

There is little doubt that housing demands of the Higher Growth and Spatially Constrained Scenarios would make it significantly more difficult to resist pressures for development of land which has not previously been developed, including greenfield land required to meet other LP objectives, such as open space and Green Belt.

The additional population under the Higher Growth and Spatially Constrained Scenarios will also increase demand for community facilities. The LHCS crude estimates of the potential requirement of land for primary schools under the Baseline Scenario suggest an annual demand to 2017 of 8 ha of land for additional schools (excluding playing fields, which are assumed to be provided on existing open space). It is not known how much of this is provided for by existing allocations, but a significant proportion is likely to require sites currently counting towards housing capacity in the LHCS. Assuming the further population under the Higher Growth and Spatially Constrained Scenarios is broadly similar in age structure to the Baseline population increase, its school requirements could add to this figure a further increment of over 5 ha per annum which would almost certainly compete for sites with housing. Together with equivalent additional demands from the higher population of the Higher Growth and Spatially Constrained Scenarios for sites for other additional community facilities (secondary schools, health facilities, etc) this would reduce the capacity of LHCS Scenario F to supply the necessary housing, even at the high density levels assumed.

These pressures will affect all sub-regions, but especially the North East and North, where over half of the total uplift on the Baseline Scenario housing provision by 2026 is projected to be accommodated (over 30% and nearly 25% respectively) compared with only around 15% in each of the three other sub-regions.

Density of residential development

As the Scenario presupposes that densities at the upper end of the LP density matrix will need to be achieved, the current policy, and the target based on ensuring that over 95% of development complies with the matrix, would be quite inadequate. A revised matrix with higher densities would need to be devised and measures put in place to ensure its provisions could be achieved. Further capacity would also need to be extracted by pressing for higher densities, where possible, on current approvals and allocations. Raising densities would be likely to raise the costs to developers of overcoming site constraints on individual sites. The raising of densities would also have consequences for accommodating adequate community facilities to support residential development and for the LP's objectives of meeting the full range of housing demand. High densities inevitably lead to a reduction in the potential to incorporate larger housing units in a development so the provision of family type dwellings would be prejudiced.

Protection of open space

As stated above, the substantial demand for further housing under the Higher Growth and Spatially Constrained Scenarios is likely to put pressure for development on remaining areas of open space in London so LP policies to protect these would need to be particularly firmly applied.

The Higher Growth and Spatially Constrained Scenarios raise another issue in relation to open space. As mentioned above, the additional population will generate demands for additional open space and for schools with playing fields. It has been assumed for the LP that much of any additional demand for school playing fields could be met on existing open space. However, together with the additional open space that may be required to meet basic (NPFA) standards this is likely to place major pressures on existing open space areas and could particularly divert some open areas to active recreation uses which are inappropriate to their character.

4.3 Objective 2: Better City to Live In

This objective is to increase housing provision in order to meet the needs of the anticipated growth in population and households and the backlog of need. Stated thus it suggests there is a given quantum of growth in households, derived from population growth, to be accommodated. However there is a circularity in this because the population projections are housing led, i.e. an estimate of the population that the expected delivered capacity of housing will accommodate, given assumptions about household size. The housing provision is an input assumption in each scenario and is not an impact of the scenario. The real issues however are the strains on the housing supply, the adequacy of the planned delivery to meet demand pressures and the realism of achieving the housing delivery assumed. Inferences about the pressures on housing can be made by comparing the scenario population projection against the unconstrained projections and the household size implied by the population projections. The challenges of delivering the assumed housing can be assessed against the past achievements and implications for the land requirements and densities (see objective 1 above).

(i) Lower Growth Scenario

Table 4.3 Policy Objective 2: Better City to Live In – Lower Growth Scenario

Conclusion on Scenario Impact	Policy Vulnerability
4 An increased supply of new homes	
Relatively low population growth pressures, combined with high incomes, allow householders to exercise their preferences and/or encourage larger households to migrate out of London enabling household size to fall in line with household formation trends	• Housing delivery required is the same as the base case minimum of 31,090 p.a. for London and Borough targets so policies unaffected (Policies 3A.1 & 3A.2)
5:An increased supply of affordable homes	
Housing delivery overall would be unaffected as would the proportion of new housing that is affordable. Lower population levels may reduce the need for affordable housing compared with the Base Case.	• Affordable housing targets in DPDs (policy 3A.7) would require revision in the light of lower population levels (Policy 3A.7) • Other policies not affected

Increased Supply of New Homes

In this scenario housing delivery is as in the Baseline, so the scenario has no effect on housing delivery and hence the supply of new homes. However, the population outcome is well below the Baseline and the slightly lower low unconstrained projection. This implies much lower population growth pressures compared with the Baseline, and the independent forces that drive trends in household formation predominating over the effects of housing constraints and price. The population would have incomes high enough to be able to exercise their household formation preference, and probably those who cannot do so moving out to the regions or being deterred from migrating to London, for example in response to concerns about quality of life for families, or simply the affordability of housing. The prosperity of the population would support a buoyant housing market and house prices so as to encourage the market to deliver the increased supply of housing that the policy allows and encourages. It also suggests much reduced international migration pressures compared with recent years, that might arise from substantially improved relative prosperity in the rest of the EU, especially among the newer member states, with recent migrants returning, and/or reduced push pressures in the rest of the world. More restrictive national policies on international migration and stronger enforcement might also be a factor. It also suggests reduced fertility rates, for example, where life styles, career pressures and the like in London discourage or delay starting a family, and encourage families to leave to more family friendly environments outside the city.

Increased supply of affordable homes

Insofar as the supply of affordable homes is closely linked to the development of market housing, there would be no identifiable difference in supply compared with the base case. However, the lower population would probably mean a reduction in the need for

affordable housing. For example, many recent migrants from Europe on low incomes would have returned, and the number of new arrivals would be reduced.

(ii) Higher Growth and Spatially Constrained Scenarios

Table 4.4 Policy Objective 2: Better City to Live In – Higher Growth and Spatially Constrained Scenarios

Conclusion on Scenario Impact	Policy Vulnerability
4 An increased supply of new homes	
Very high demand pressures bring about raised development pressures and a reappraisal of policy. Housing delivery increases to provide the maximum capacity scenario estimated in the London Housing Capacity Study, however very high population growth pressures prevent household size falling as residents would wish (as indicated by household formation trends), with overcrowding persisting	• Housing delivery required is substantially above the minimum of 31,090 p.a. for London and Borough targets Whilst not strictly in conflict with the policy, the scenario requirement of 40,680 is so much higher as to render the policy in practice in need of immediate revision. (Policies 3A.1 & 3A.2).
5:An increased supply of affordable homes	
Increased delivery of housing overall would enable and increased supply of affordable housing, but not necessarily any increase in the proportion of new housing that is affordable. The higher proportion of new housing on large sites may in practice make the 50% target easier to achieve	• Affordable housing targets in DPDs would require revision in the light of higher population and household levels (Policy 3A.7) • Other policies not affected

Increased Supply of New Homes

In this scenario very strong population growth pressures predominate and constrain the social and economic forces leading to falling household size. This pressure would result in a response in housing delivery, raising it substantially above the Baseline, so the scenario has the effect of increasing the supply of new homes by some 30% to over 40,000 dwellings a year in the first ten years. This is on top of an already ambitious target when compared with recent trends in delivery of some 25,000 (including reduction in vacancy and non self-contained). Population growth is equivalent for most of the period to the high, unconstrained population projection, although constrained in the later years by the inability to increase housing delivery sufficiently. Net international migration, encouraged by relative prosperity and job demand in London, a relaxed regulatory regime, expansion of the EU, and increased push factors in the rest of the world, would remain at the high levels of recent years. Fertility levels would be relatively high, raising household size.

A measure of the strains this produces is the fact that the household size cannot fall significantly from the relatively high levels of 2001, and certainly cannot allow Londoners to exercise their household formation preference as indicated by trends and as projected by the recent ODPM household forecasts. Overcrowding would persist and

frustrate lifestyle aspirations. Young people would find it more difficult to leave home. House prices would be higher creating severe problems of affordability among large sections of the population. Consequently, the fact that the supply of new homes would have increased by more than in the Baseline, would not be an indication of an improvement in the housing supply situation, which would have in fact deteriorated in relation to need.

The other important point is that increasing the housing supply in this way would be enormously difficult (see Objective 1). The achievement of the scenario would result from the strength of the population pressures and housing crisis forcing an early change in policy to raise housing supply targets as an urgent priority and overriding the likely strong local objections. It also requires the market to respond by delivering. High house prices and high returns from housing development would help.

An Increased supply of affordable homes

The increase in the supply of market housing would help the supply of affordable homes to increase as well, by cross subsidy from market housing (and possibly other uses in mixed schemes). This would not necessarily increase the proportion of new housing that is affordable, although a higher proportion of new housing, in this high capacity/delivery scenario, would be on large sites and the average number of units in developments would increase, which could make a particular average percentage target of affordable housing a little easier to achieve. However the need for affordable hosing would also rise, so that the overall position for affordable housing in relation to need might not improve and could deteriorate, if the proportion of the additional households in need of affordable housing were higher than in the Baseline.

4.4 Objective 3: More Prosperous City

This section tests policies with respect to assumed differences in job trends and distribution. London Plan policies are less about generating growth, than removing obstacles to growth. The Base Case job projection is, therefore, assumed to be consistent with various London Plan policy initiatives.

The implications of the scenarios for some of the objectives depend on whether the labour market is perceived as tightening or loosening relative to the baseline. As noted in Chapter 3, all the variant scenarios (Lower Growth, Higher Growth, Spatially Constrained) see a proportionately larger shift in population than in jobs. Thus the Higher Growth and Spatially Constrained Scenarios see a greater increase in the working population than in the number of jobs. This would tend to loosen the labour market. The reverse is true for the Lower Growth Scenario, which yields a tightening labour market. However, since the tightness of the labour market depends upon the relative movement in working population and jobs one should not conclude that a 'high' growth scenario is necessarily bad for prosperity and social inclusion and a 'low' growth scenario is necessarily good.

(i) Lower Growth Scenario

Table 4.5 Policy Objective 3: More Prosperous City – Lower Growth Scenario

Conclusion on Scenario Impact	Policy Vulnerability
6 Increasing sustainability of social inclusion by increasing proportion of residents working in London	
No appreciable change assumed in proportion economically active. No analysis of London out-commuting.	• Efforts to raise participation rates generally in London assisted by tighter labour market (Policy 3B.12) • Commuter clawback policies by the Regions could affect outcomes. (Policy 3B.12)
7 Ensure there is sufficient development capacity in the office market	
Capacity is adequate. Fewer office jobs in this scenario means that less capacity needs to be drawn upon. The north-east sub-region contributes significantly to this loss of office jobs. The draw down on capacity there will be less.	• Assuming measures are sufficient to bring forward the number of permissions needed in the Base Case; this weaker growth should not present undue policy challenges. (Policy 3B.2) • Monitor and manage policies will be relatively more important. (Policy 3B.2)
8 Direction of economic and population growth to follow sub-regional allocations	
Not possible to analyse impacts on Opportunity Areas and Areas of Intensification directly. Sub-regional 2-3% adverse impact on jobs by 2026 in North East and South East. While population is 6.1% lower in aggregate by 2026, there is no sub-regional bias. Challenges would seem to fall comfortably within a monitor and manage framework.	• Weaker job growth places more pressure upon collective policies to steer growth eastwards. (Policy 2A.1i)

Increasing sustainability of social inclusion by increasing proportion of residents working in London

Policy 3B.12 seeks to raise labour market participation rates by removing the barriers to employment. The scenario assumes no change in London's overall participation rate. The relative tightening of the London labour market in this scenario is due to a greater percentage fall in population than in jobs. This would tend to raise wages in the London area and hence, across London as a whole, encourage more Londoners to participate in the labour market (although in the scenario itself the participation rate has been held constant). Labour market tightening would also tend to encourage those living outside London to seek the now relatively higher paid work in London and hence commute in

greater numbers. The likely balance of residents working in London is difficult to predict without developing models that integrate both labour supply and demand responsiveness to wage rates across London. The commuting decision also depends on commuting costs and relevant transport capacities

If the various, largely non-spatial, policy efforts targeted at removing the barriers to labour market entry, were increased then wages might not increase relatively and in-commuting would be contained. Thus, one conclusion might be that in the context of the fairer wind provided by this scenario, there is a good argument for capitalising on the opportunity and redoubling efforts related to training, skills, etc. Whether more or less commuting in and out of London reduces, for example, carbon emissions depend upon the character of intra-London commuting that replaced it.

To the extent that areas with low participation rates are in the east London, the somewhat greater falls in jobs in the North and South East sub-regions will tend to work against drawing inhabitants there into the labour market. So this feature of the scenario might work against the policy. Part of policy 3B.12 is to capitalize on the local employment opportunities created by the Olympics. The job trends in the Base Case and Scenarios, do not take explicit account of the effect of the Olympics on jobs. Although these may not be large[1] it would still be worth making particular efforts to target Olympic-related jobs to local communities within the context of a weaker job-growth scenario.

As a result of the difficulty in capturing these complex interactions, the model used for the scenarios has, by assumption, passed the adjustment to a tighter London labour market to higher net in-commuting. The simplifying assumption is of almost an infinite elasticity of supply of labour from outside London. Of course, policy efforts in surrounding regions to reduce the amount of commuting to London may also be increased as London's labour market tightens. The outcome for London's policy of having more Londoner's work in London will also be contingent upon policy reactions outside London.

Ensure there is sufficient development capacity in the office market

The office capacity identified by RTP and used in this exercise (see section B.3.2 of Appendix B) are more than adequate for the Base Case and certainly so for the Lower Growth Scenario. The weaker job growth assumption tends to weaken the North East and South-East by more than the other sub-regions (see Table B.5 of Appendix B). This reflects the tendency for 'traditional / established' areas still to be able to offer capacity to the disadvantage of the 'newcomer' areas. Since developers seeking permission will tend to reflect the state of office demand, for the indicator espoused by the plan - number of permissions to starts – there is no reason to believe that it will be challenged by this scenario. Policy 3B.2 is not challenged by the Lower Growth Scenario, though the monitor and manage provisions are likely to come into greater play.

Direction of economic and population growth to follow sub-regional allocations

This scenario essentially reduces population equally across sub-regions. Jobs are also fewer but there are relatively fewer in the North and South East sub-regions (see Table B.5 of Appendix B). This alters not only the balance of the plan in terms of spatial

[1] The Olympic Games Impact Study commissioned by the DCMS and LDA put the impact on jobs between 2005-16 at just 8,000 in the North East and 39,000 for London as a whole.

development but may have implications for the financing of the transport network (see below). The slightly weaker effective density of employment in the Eastern sub-regions could weaken the productivity dynamics that shift growth in that direction but this is not reflected in the projections. However, the overall shift in the relative distribution of jobs is not so great as to challenge a policy of monitor and manage.

(ii) Higher Growth Scenario

Table 4.6 Policy Objective 3: More Prosperous City – Higher Growth Scenario

Conclusion on Scenario Impact	Policy Vulnerability
6 Increasing sustainability of social inclusion by increasing proportion of residents working in London	
Slight increase in activity rates assumed. Relative weakening of London Labour Market with larger proportionate increase in population than jobs. Generally less net in commuting. Would tend not to support this policy plank	• Efforts to raise participation rates generally in London weakened by looser labour market (subject to commuting) (Policy 3B.12) • Weaker performance of North East sub-region likely to weaken chances of policy success. (Policy 3B.12)
7 Ensure there is sufficient development capacity in the office market	
Capacity is adequate despite more office jobs in this scenario. The North operates at fairly full capacity throughout the period while the North-East moves towards full capacity by 2026.	
8 Direction of economic and population growth to follow sub-regional allocations	
Not possible to analyse impacts on Opportunity Areas and Areas of Intensification directly. Sub-regional 3% positive impact on jobs by 2026 in North East and South East – relatively greater than other regions. While population is generally 9-10% higher by 2026, there is sub-regional bias towards the North-East (13%). Challenges would seem to fall comfortably within a monitor and manage framework.	• Risks attendant upon delivering the extra housing, particularly in the North-East. (Policy 2A.1i)

Increasing sustainability of social inclusion by increasing proportion of residents working in London

This scenario, unlike the Lower Growth Scenario, is predicated upon a generally weaker labour market, which will tend to reduce the growth in real wages in London. Though jobs increase significantly, the population increases by much more. If sustained, this would tend generally to weaken participation rates across London and, perhaps, more so in the North East where the increase in population relative to jobs is greatest.

The somewhat weaker labour market discourages in-commuting from outside London and may well increase out commuting. The precise outcome with regards to commuting depends on commuting costs, capacities and how the transport network evolves (see below). The scenario assumes that participation rates remain the same so the impact of these shifts in population and jobs is translated directly to a decrease in net in-commuting of 20% by 2026. It would require the participation rate (measured as the percentage of those aged 16 to 74 who are in or seeking work) in that year to fall somewhat below 68% compared with the Baseline of 70% to eliminate the fall in net in-commuting. As with the Lower Growth Scenario, an assessment of the precise balance struck between these two would require an integrated model. It should also be noted that the implied fall in wages might well increase the investment in new jobs over a period and at the same time weaken in-migration into London. The outcome might well be a higher growth scenario than the Baseline Scenario but better balanced than the Higher Growth Scenario.

If policies to raise participation rates were sufficiently powerful to buck these negative trends, then, with a fixed number of jobs as assumed in the scenario, they would aggravate the weaker labour market and the need for such policies on the grounds of equity of opportunity may be that much greater. However, if historic experience is a guide, the response to an increase in labour supply and a probable initial increase in unemployment would be a reduction in the rate of growth of real wages below what is would otherwise have been, leading to an expansion of employment. The role of the Olympics in generating jobs is neither a feature of the Base Case nor the Scenario; however, its strategic importance in sustaining the North East sub-region is increased under this scenario though its power to do so is limited.

A countervailing influence might alter or mitigate the above conclusions. With more jobs in London, the effective employment density would tend to be greater and so would productivity and probably real wages. This effect may cut across the consequence that a proportionately higher workforce would have on reducing wages. The net position is difficult to assess but as a judgement, the risks must be that scenario real wages would be lower.

Ensure there is sufficient development capacity in the office market

Despite the good growth in office jobs under this scenario, identified capacity seems to be sufficient. The North sub-region remains at high capacity utilisation for most of the period and all other regions improve during the course of the period, particularly the North East.

Office jobs are attracted to areas with the greatest potential capacity (see section B.3.2 of Appendix B for explanation). The implicit assumption is that other conditions are not likely to adversely affect development. Thus the transport network must be capable of

delivering sufficient capacity and reasonable commuting costs. Similarly policies designed to encourage social housing should not so weaken the rates of return on office development as to deter adequate investment.

As the scale of office development grows there is even more pressure upon policies seeking to create layouts for office buildings that are aesthetic and environmentally well-balanced with open spaces, such that the momentum of development continues in the growth areas and is not retarded by unsightly growth.

Direction of economic and population growth to follow sub-regional allocations

On the whole the stronger jobs growth, particularly in the North-East is generally favourable to policy. It is dependent upon an adequate transport system and developers not being discouraged in other respects from investing in the growth areas.

(ii) Spatially Constrained Scenario

The Spatially Constrained Scenario is like the Higher Growth Scenario in respect of jobs and population assumptions except that those boroughs with the greatest office development potential are capped at lower levels. This can be seen to reflect an allowance for the relatively crude mechanism used to allocate office jobs but also other impediments (non-transport) that might inhibit office investment.

Table 4.7 Policy Objective 3:More Prosperous City – Spatially Constrained Scenario

Conclusion on Scenario Impact	Policy Vulnerability
6 Increasing sustainability of social inclusion by increasing proportion of residents working in London	
Slight increase in activity rates assumed. Relative weakening of London Labour Market with larger proportionate increase in population than jobs. Generally less net in commuting. Would tend not to support this policy plank	• Efforts to raise participation rates generally in London weakened by looser labour market (subject to commuting) (Policy 3B.12) • Dramatically weaker jobs performance of North East sub-region likely to weaken chances of policy success there by 2026 but stronger performance by North and South-West likely to offset. (Policy 3B.12)
7 Ensure there is sufficient development capacity in the office market	
Office capacity is in aggregate probably sufficient but very tight across London by 2026.	• Greater pressure on traditional areas with more limited remaining capacity. (Policy 3B.2)

8 Direction of economic and population growth to follow sub-regional allocations	
Employment in the North-East is by 2026, 1% below the Base Case, while population is some 13% greater. The pressure for jobs is towards the West, creating a markedly different set of travel patterns and pressures on the transport network.	• Marked market resistance to develop offices in areas that have been seen as unattractive; monitor and manage policies will have to be capable of identifying the unfavourable trend sufficiently early to arrest it. Emphasis required on improving amenity and marketing improvements in "new" areas. (Policy 2A.1i)

Increasing sustainability of social inclusion by increasing proportion of residents working in London

In many respects this scenario is similar to the Higher Growth Scenario. The shift in the location of jobs means that it may be tougher to raise participation rates in the North East, particularly with the strong projected population increase. Prima facie, it would seem likely that a significant move towards commuting outside of the sub-region and perhaps out-of London. This will have an impact on the use and requirements for transport (see below).

Olympics-related job creation, becomes more important in order to help counter this sub-regional weakness and a climate that would adversely affect increasing participation rates, although its capacity to do so is limited.

Ensure there is sufficient development capacity in the office market

There is just enough office capacity across London by 2026 but it is very tight indeed. The scenario probes the potential for developers to shun new growth areas, notwithstanding transport provision and availability of planning permission. The scenario could be reflective of a stand-off with developers who judge that the planning authorities will review their preferred office densities and allow greater intensification in received areas. They may be encouraged in this view by potential office leaseholders expressing a strong preference for new space close to existing locations. The effect is to have a quite marked impact upon the sub-regional pattern of jobs.

The policy challenge here is that of influencing market perceptions. This may require providing more emphasis on policies that improve the amenity and physical appearance of the areas in question as well as marketing the improvements.

Direction of economic and population growth to follow sub-regional allocations

Clearly the scenario challenges the sub-regional allocations. It essentially raises the risk associated with the analysis that the assumed degree of relative expansion to the East can be realised by plan policies.

The reduced employment effective density in the North East could reduce productivity and real wages in the sub-region.

4.5 Objective 4: Social Inclusion

The social impacts of the scenarios are even harder to assess than the economic impacts. However some of the social impacts flow directly from the employment changes. Indeed the component of Objective 3 on improving employment opportunities for Londoners discussed in the previous section is also important to the social inclusion agenda. Social performance targets have been set for different aspects of the policy related to 'Increased employment opportunities for disadvantaged':

- Age specific unemployment rates for BME groups to be no higher than for white pop by 2016, 50% reduction of difference by 2011
- Percentage of lone parents dependant on income support to be no higher than UK average by 2016, 50% reduction of difference by 2011.

Development policies in DPDs in or close to Areas of Regeneration should set out how they '*could contribute towards meeting national floor targets and locally determined targets or employment, crime, health, education, social housing and the environment, as well as wider neighbourhood renewal initiatives*."

The difficulty of relating broader economic changes to narrow social groups on the one hand or wider social issues such as health and education on the other precludes much comment on the consequences for social inclusion. However, there is a wide body of research that suggests that more buoyant labour markets tend to raise the employment prospects of socially excluded groups although not always by enough to reduce the gap between employment prospects of these groups and the populations as a whole[2].

(i) Lower Growth Scenario

Table 4.8 Policy Objective 4: Social Inclusion – Lower Growth Scenario

Conclusion on Scenario Impact	Policy Vulnerability
9 Increased employment opportunities for disadvantaged – BME unemployment rates	
Indeterminate impact on BME unemployment. Tighter labour market generally should be more supportive.	Policy challenge uncertain.
10 Increased employment opportunities for disadvantaged – Lone parents Income Support Dependency	
Indeterminate impact on lone parents' income support dependency. Tighter labour market generally should be more supportive.	Policy challenge uncertain.

[2] Dickens, Gregg and Wadsworth (2001), *What Happens to the Employment Prospects of Disadvantaged Workers as the Labour Market Tightens*, in Dickens, Gregg and Wadsworth (ed) The State of Working Britain Update 2001. See also Dickens, Gregg and Wadsworth (ed) 2003, The Labour Market Under New Labour: The State of Working Britain.

11 Improving performance against Neighbourhood Renewal floor targets	
Weaker economic growth may provide fewer opportunities for Neighbourhood Renewal with knock-on consequences for floor targets.	Policy challenge uncertain.

Increased employment opportunities for disadvantaged and improved performance against Neighbourhood Renewal floor targets

While there are fewer jobs, there are also fewer workers. The tighter labour market, implying higher wages and more participation, should provide a relative more favourable environment for achieving the targets. Assuming, for the moment, that the social composition of the population is not changed we would expect a similar proportion of socially excluded groups. There is a greater likelihood that under these circumstances unemployment rates would fall for all, including BME's. The same circumstances should help lone parents. Since the population component of this scenario is no more housing constrained than in the Baseline Scenario, there is no reason to assume that higher housing costs will have adversely affected the welfare of these groups. Lower household size, which is assumed in the scenario, might arise in a number of ways that could have implications for these objectives. For example, it might be consistent with larger families moving out of London, a higher instance of lone parents or of single international immigrants. Thus the relative proportion of the socially excluded groups might not stay the same. Thus though the tightening labour market might improve the employment prospects for the target groups, their number might increase in this scenario. For this reason there is some uncertainty regarding the robustness of these policies under this scenario.

Weaker job growth is likely to be consistent with weaker economic growth and tax revenues at constant tax rates. By assumption, the level of new housing provision is unchanged so this should continue to provide housing opportunities. However, it seems reasonable to speculate that there will be fewer non-housing-led renovations (e.g. new office and retail developments) that might provide useful platforms for Neighbourhood Renewal schemes. This need not mean that there are sufficient opportunities for the funds available, as this remains a political decision on priorities.

(ii) Higher Growth Scenario

Table 4.9 Policy Objective 4: Social Inclusion – Higher Growth Scenario

Conclusion on Scenario Impact	Policy Vulnerability
9 Increased employment opportunities for disadvantaged – BME unemployment rates	
Indeterminate impact on BME unemployment. Looser labour market should be generally less supportive.	Unfavourable policy challenge.
10 Increased employment opportunities for disadvantaged – Lone parents Income Support Dependency	
Indeterminate impact on lone parents' income support dependency. Looser labour market should be generally less supportive	Unfavourable policy challenge.
11 Improving performance against Neighbourhood Renewal floor targets	
Indeterminate impact on Neighbourhood Renewal floor targets.	Favourable policy challenge.

Increased employment opportunities for disadvantaged and improved performance against Neighbourhood Renewal floor targets

In this scenario though the number of jobs increases, the population increases by far more. The implied looser labour market would probably tend to work against the achievement of the various targets. Assuming, for the moment, that the proportion of socially excluded people remains unchanged, then their number increases. The prospect must be that not only would this group be less likely to find employment but that fewer would participate in the labour market. It seems unlikely that this group, particularly lone parents for whom time constraints are a significant consideration, would seek work outside London. Though more jobs in the North-East, up 34,000 on the Baseline Scenario by 2026, may disproportionately help this target group, the population increase on the Baseline Scenario is also substantial, at 222,000.

The assumption of an unchanged proportion of socially excluded people, may be optimistic. The scenario envisages higher net international migration. While the composition of this change has a major bearing on the impacts, if as seems likely that there will be an increased number of immigrants with limited capital, both human and financial, then there could be an increase in the proportion of the socially excluded. This would challenge policies to reduce BME unemployment rates and help lone parents. Though the household size is slightly higher in 2026 than in the Baseline Scenario (2.38 versus 2.30), perhaps implying fewer lone parent families, it would seem an unreasonably optimistic speculation. While this scenario is not favourable to the Plan's policies objectives, it must be remembered that it is not growth per se that causes this but the higher rate of population growth relative to job growth.

As far as Neighbourhood Renewal is concerned, this scenario could be helpful in providing a greater number of new housing and commercial developments that could serve as useful platforms. This could assist public funds going further in achieving renewal aims. The scenario is probably consistent with somewhat greater overall growth and there may be the prospect for more public funds for this scheme.

(iii) Spatially Constrained Scenario

Table 4.10 Policy Objective 4: Social Inclusion – Spatially Constrained Scenario

Conclusion on Scenario Impact	Policy Vulnerability
9 Increased employment opportunities for disadvantaged	
Indeterminate impact on BME unemployment. Looser labour market should be generally less supportive. Relatively poor prospects in	Unfavourable policy challenge.
10 Increased employment opportunities for disadvantaged	
Indeterminate impact on lone parents' income support dependency. Looser labour market should be generally less supportive	Unfavourable policy challenge.
11 Improving performance against Neighbourhood Renewal floor targets	
Indeterminate impact on Neighbourhood Renewal floor targets. To the extent that there is reduced office development and fewer jobs in the North-East sub-region, reaching floor targets here may be more difficult	Favourable policy challenge.

Increased employment opportunities for disadvantaged and improved performance against Neighbourhood Renewal floor targets

While this scenario is similar to the Higher Growth Scenario, it has the distinctive feature of capping office development in a number of boroughs with the consequence of reallocating jobs to different areas. The impact on job creation in the North East is quite severe, obliging a greater number of those living in the area to seek employment outside the sub-region. Transport improvements in this sub-region might extend the travel-to-work area for residents but clearly at a cost. There is likely to be quite a profound impact on participation rates and probably employment rates for the socially excluded groups. The consequence of this scenario is to localise the problems of social exclusion in a particular sub-region. So while the policy challenges may not change in the aggregate their concentration in particular areas runs the risk of dynamic social decline.

4.6 Objective 5 - Improve London's Accessibility

(i) Introduction

This section tests policies with respect to improving accessibility in London. The London Plan identifies a need to encourage a significant shift in the modal share accounted for by use of the car towards PT travel and other travel modes. In order to achieve this objective, the LP recognises the need for substantial investment in the transport network in order to provide a 50% increase in PT capacity. The overarching economic aim of Objective 5 is to facilitate economic growth in the identified opportunity and intensification area – particularly in east London.

Thus Objective 5 is tested with respect to assumed differences in transport provision. As we have stated earlier, the London Plan policies are less about generating growth, than removing obstacles to growth. Therefore, we address below the extent to which the two transport scenarios (the Baseline Case and the London Plan Case – see section 3.4) will be able to facilitate the variant scenarios. The Baseline Case is broadly consistent with various London Plan policy initiatives and as is noted in Transport 2025 '*it has to have sufficient capacity to meet London's future growth*'[3].

As discussed in section 2.2, the aim of transport modelling undertaken by TfL has been to provide a strategic examination upon the aggregated impact of numerous transport improvements in London based on the Baseline Case (BC) and the London Plan Case (LPC). This has been applied to both the lower and higher growth scenarios.

[3] Transport 2025, Transport Challenges for a Growing City, TfL, July 2006

(ii) Lower Growth Scenario

Table 4.11 Policy Objective 5: Improve Accessibility – Lower Growth Scenario

Conclusion on Scenario Impact	Policy Vulnerability
12 - 14 Achieve reduced reliance on private car and more sustainable modal split for journeys	
The LPC not only facilitates more public transport trips but also results in a switching of trips from cars to PT and walking/cycling. Vehicle kilometrage on highways decreases by some 1% with the LPC compared with the BC. Compared to the baseline, the lower growth scenario would decrease vehicle kilometrage by some 7%. Both PT trips and walking/cycling account for significantly higher percentage of trips under the LPC. As a consequence, car usage declines from 46% of all trips with the BC to 45% with the LPC (based on the modelled definition of trips).	The decreased reliance upon private transport is achieved as a result of (i) significant higher levels of PT provision and (ii) the implementation of hard and soft transport management measures such as teleworking, workplace travel plans, walking and cycling plans, congestion zone charging etc. The policy objectives are both dependent upon the London Plan Transport scenario and upon the above mentioned transport management measures. (Policies 2A, 3C and 4C)
15 -16 Increase in public transport capacity	
The TFL analysis shows that the impact of the Lower Growth Scenario results in a reduction in accessibility by PT and Highway of 6% for population and 1.5/2.4% for employment (see Appendix B). Key transport 'contributors' to meeting these increases will be underground upgrading, Crossrail, East London Line and the National Rail improvements.	It is evident that the funding of many major transport infrastructure schemes is dependent on a combination of public and private sector support. Within the public sector, funding will originate from both local and central government. There naturally remains uncertainty about funding sources for schemes such as Crossrail and Thameslink 2000. On the other hand major schemes such as the Channel Tunnel Rail Link and DLR developments are being implemented. The delivery risks of increasing transport capacity conducive to accommodating Lower Growth Scenario population and employment forecasts do not cease to exist despite the reduced dependence on increased capacity. Any failure to deliver BC projects such as Crossrail and LUL upgrading would make these capacity objectives vulnerable. (Policy 3C)

17 Increase in number of jobs located in areas with high PTAL values	
Borough level analysis can be conducted when required at a later stage in order to assess local impacts. This sub-objective consists of a monitoring role and GLA/TfL will be able to establish a process to review the progress of integrating transport and development taking account of agglomeration impacts etc. The GLA will also wish to ensure that employment generation in areas with high PTAL values provides a net increase in employment in London and is not just a function of displacement.	The DfT methodology for providing accurate assessments of such impacts is very much innovatory and remains open to considerable improvement. The Lower Growth Scenario assumes a lower than average (London wide) employment growth in certain Boroughs - particularly in east London – partially lessening the need for massive transport infrastructure development. (Policies 2A and 3C)

Overall, the attainment of the Objective 5 policy targets will not be placed under obvious pressures given the successful implementation of the Baseline Case. However, failure to deliver one of the major schemes (i.e. Crossrail 1and/or major underground upgrading) will seriously prejudice virtually all the policy targets – particularly relating to modal switching away from private car usage and the 50% increase in public transport capacity.

Non-fulfilment of the transport policy targets is not an issue with the London Plan transport scenario – indeed given a low economic growth scenario there is unlikely to be an economic justification for additional large-scale transport investment.

(iii) Higher Growth and Spatially Constrained Scenarios

Table 4.12 Policy Objective 5: Improve Accessibility – Higher Growth and Spatially Constrained Scenarios

Conclusion on Scenario Impact	Policy Vulnerability
12 - 14 Achieve reduced reliance on private car and more sustainable modal split for journeys	
The LPC not only facilitates more public transport trips but also results in a switching of trips from cars to PT and walking/cycling. Vehicle kilometrage on highways decreases by 1% with the LPC compared to the BC. Compared to the baseline, the higher growth scenario would increase vehicle kilometrage by some 11%. Both PT trips and walking/cycling account for significantly higher percentage of trips under the LPC. As a consequence, car usage declines from 46% of all trips with the BC to 45% with the LPC (based on the modelled definition of trips).	The decreased reliance upon private transport is achieved as a result of (i) significant higher levels of PT provision and (ii) the implementation of hard and soft transport measures such as teleworking, workplace travel plans, walking and cycling plans, congestion zone charging etc. The policy objectives become more vulnerable in the context of high growth and the Baseline Transport Scenario. (Policies 2A, 3C and 4C)
15 -16 Increase in public transport capacity	
The Higher Growth Scenario experiences an improvement in PT and Highway accessibility of 8-9% for population and 2.5-4% for employment (see Appendix B). Key transport 'contributors' to meeting these increases will be underground upgrading, Crossrail, East London Line and the National Rail improvements. In particular, the underground system and the National Rail 'residual' would need to provide increasing capacity compared with Lower Growth Scenarios.	It is evident that the funding of many major transport infrastructure schemes is dependent on a combination of public and private sector support. Within the public sector, funding will originate from both local and central government. There naturally remains uncertainty about funding sources for schemes such as Crossrail and Thameslink 2000. On the other hand major schemes such as the Channel Tunnel Rail Link and DLR developments are being implemented. The delivery risks of increasing transport capacity conducive to accommodating the Higher Growth and Spatially Constrained Scenarios population and employment forecasts are considerable. Failure to deliver projects such as Crossrail and Thameslink 2000 would almost certainly result in a failure to meet the overall policy objective. Certainly, there must be doubts whether the Baseline Transport Scenario would provide sufficient capacity to ensure compliance with this objective. (Policy 3C)

17 Increase in number of jobs located in areas with high PTAL values	
Borough level analysis can be conducted when required at a later stage in order to assess local impacts. This sub-objective consists of a monitoring role and GLA/TfL will be able to establish a process to review the progress of integrating transport and development taking account of agglomeration impacts etc. The GLA will also wish to ensure that employment generation in areas with high PTAL values provides a net increase in employment in London and is not just a function of displacement.	The DfT methodology for providing accurate assessments of such impacts is very much innovatory and remains open to considerable improvement. The Higher Growth Scenario assumes a higher than average employment (London wide) growth in Opportunity Areas. The provision of high levels of transport infrastructure investment needs to be complemented by economic and social policies that facilitate employment growth in areas with high PTAL values. Failure to accurately monitor the integration of transport network growth with the 'PTAL' areas' employment generation could result in missing early signs of the need for extra management and possible intervention. The Spatially Constrained Scenario forecasts employment levels in the North East London sub-region at levels just below the Lower Growth Scenario. As such the comments above apply to The Spatially Constrained Scenario. (Policies 2A and 3C)

Some 23% of transport links exhibit serious levels (PGC ratio of >1.0) of overcrowding in the Higher Growth Scenario with the BC. A further 7% of transport links are likely to experience high levels of overcrowding. The knock-on impacts for modal shifting and the facilitation of employment in areas of high PTAL values are likely to place these policy objectives under pressure. A decline in overcrowding is seen with the LPC with 20% of links with a PGC ratio of >1.0.

(iv) Conclusions

It is evident that whilst the LPC will considerably enhance the likelihood of facilitating Higher Growth and Spatially Constrained Scenarios (and by definition the Lower Growth Scenario), the BC will not necessarily provide comfort that the PT network will be able to facilitate the high growth scenario. Certainly, a failure to commence Crossrail 1 within the Plan period would place in jeopardy public transport capacity growth targets and in turn would prejudice the economic growth policies in the opportunity and intensification areas. There must also be concerns that with Higher Growth, the Baseline Transport Scenario will not provide sufficient PT capacity to achieve modal shifting objectives.

The LPC will not be required to meet the Policy Objectives in the context of the Lower Growth Scenario.
The full realisation of Policy 3C.9 – '*increasing capacity, quality and integration of public transport to meet London's needs*' – is required to ensure meeting all the targets under Objective 5 - even under the Lower Growth Scenario.

4.7 Objective 6: More attractive, well-designed and green city

(i) Lower Growth Scenario

Table 4.13 Policy Objective 6: More Attractive, Well-Designed and Green City – Lower Growth Scenario

Conclusion on Scenario Impact	Policy Vulnerability
18 Protection of biodiversity habitat	
No impact	No additional policy vulnerability
19/20 Increase in household waste recycled or composted	
No impact	No additional policy vulnerability
21 Increased regional self-sufficiency for waste	
Slightly easier to achieve targets but still difficult in earlier years	• Waste strategy policy and targets (4A.1) • Spatial policies for waste management (4A.2)
22 Reduce carbon dioxide emissions	
Easier to achieve targets.	No additional policy vulnerability
23 Increase in energy generated from renewable sources	
No impact	No additional policy vulnerability
24 Ensure a sustainable approach to flood management.	
No impact	No additional policy vulnerability
25 Protecting and improving London's heritage and public realm	
No impact	No additional policy vulnerability

Protection of biodiversity habitat

As the housing demands of the Lower Growth Scenario are the same as those of the Baseline Scenario there would be no greater pressure on biodiversity resources.

Increase in household waste recycled or composted and regional self-sufficiency for waste

Assuming the full implementation of the Mayor's Waste Strategy, the slightly lower population under the Lower Growth Scenario has similarly slightly lower projected waste arisings compared to those of the Baseline Scenario (3% less by 2026), the increase over 2001 levels being 11% lower. There is no reason to suppose this would lead to any difference between the two scenarios in the potential to increase the percentage of household waste recycled or composted. However, the lower total waste arisings under the Lower Growth Scenario should help towards meeting the London Plan targets for waste to be managed within London. The capacity of waste management facilities proposed in the London Plan will be sufficient to handle 75% of waste in London by 2010, 84% by 2015, and 88% by 2020, in the later years an improvement on the London Plan targets of 75%, 80% and 85% respectively. The targets will be difficult to meet in the earlier years under both the Lower Growth Scenario and the Base Case.

Reduce carbon dioxide emissions

As no data are available on CO_2 emissions from private transport and the output for public transport has not been generated on a basis comparable to that for non-transport emissions, it is not possible to assess performance directly against the London Plan percentage emission reduction targets. Instead, the non-transport and public transport elements can be compared with output for these elements under the Baseline Scenario on the assumption that their contributions will be broadly low enough to achieve the targets, including the reduction to 85% of 1990 levels by 2026.

For the non-transport component (which is likely to contribute up to 80% of total annual CO_2 emissions), annual CO_2 emissions under the Lower Growth Scenario are consistently lower than under the Baseline Scenario by a percentage increasing to 1.6% by 2026, Emissions from public transport are roughly projected to be some 4% lower than under the Baseline Scenario whether these two scenarios are compared assuming the full London Plan Transport Scenario network or the more limited Baseline Transport Scenario network. It should therefore be slightly easier to meet the targets under the Lower Growth Scenario.

Increase in energy generated from renewable sources

There is no particular reason why the lower level of population and employment in the Lower Growth Scenario should either aid or hinder achieving the objective of increasing the amount of energy generated from renewable sources.

Ensure a sustainable approach to flood management

The housing demands of the Lower Growth Scenario are the same as those of the Baseline Scenario so there would be no greater pressure to accommodate new housing on land liable to flooding.

Protecting and improving London's heritage and public realm

There is no particular reason why the lower level of population and employment in the Lower Growth Scenario should either aid or hinder achieving the objective of improving London's heritage and public realm.

(ii) Higher Growth and Spatially Constrained Scenarios

As the Higher Growth and Spatially Constrained Scenarios have the same housing requirement and similar total space requirements for all uses, their impacts on the achievement of Objective 6 will be very similar. Their differences in terms of distribution of jobs cannot be picked up by the Environment-Economy Model whose inputs and outputs are London-wide only.

Table 4.14 Policy Objective 6: More Attractive, Well-Designed and Green City – Higher Growth and Spatially Constrained Scenarios

Conclusion on Scenario Impact	Policy Vulnerability
18 Protection of biodiversity habitat	
Potential adverse impacts due to reduction in open land and sites	• Threat to potential to conserve and enhance biodiversity and promote nature conservation (3D.12)
19/20 Increase in household waste recycled or composted	
Higher levels of solid waste arisings, placing substantial pressure on planned waste management facilities and constraining potential for higher levels of waste recycling.	• Limits potential to increase waste recycling component of Mayor's Waste Strategy (4.A.1)
21 Increased regional self-sufficiency for waste	
Higher levels of solid waste arisings, placing substantial pressure on planned waste management facilities.	• Waste strategy self-sufficiency targets are unlikely to be met, especially in the early years of the Plan (4A.1) • Likely need to provide additional waste management facilities from early years onwards but difficulties obtaining suitable sites in view of strong competition from housing and other uses (4A.2)
22 Reduce carbon dioxide emissions	
Higher levels of CO_2 emissions, reducing impact of London Plan in reducing greenhouse gases	• CO_2 emission reduction targets less likely to be met, compromising aim to mitigate climate change (4A.2ii) • Need to further increase investment in renewable energy infrastructure (4A.7) • Need to further increase investment in developing the hydrogen economy (4A.5ii)

23 Increase in energy generated from renewable sources	
No identifiable impact	No additional policy vulnerability
24 Ensure a sustainable approach to flood management.	
More intensive use of flood risk areas, limiting the effectiveness of functioning flood plans and increasing run-off.	• Difficult to avoid permitting developments on functioning flood plains (4A.5v) • Additional run-off from intensively developed areas likely to hinder effective flood risk management and application of sustainable drainage systems (4A.5vi/vii)
25 Protecting and improving London's heritage and public realm	
No identifiable impact	No additional policy vulnerability

Protection of biodiversity habitat

Although the LHCS Scenario F excludes from consideration designated conservation areas, the substantial additional housing demands described under Objective 1 would increase the pressure to permit development that might potentially threaten such areas.

Increase in household waste recycled or composted and in regional self-sufficiency for waste

The higher population and job levels under Scenario the Higher Growth and Spatially Constrained Scenarios increase total waste arisings such that by 2026, even assuming the full implementation of the Mayor's Waste Strategy as it relates to waste minimisation and re-use, the total annual arisings are projected to be over 3% greater than under the Baseline Scenario, and the increase over 2001 levels 13% higher. Under the Higher Growth and Spatially Constrained Scenarios the facilities proposed under the LP to deal with waste within London will be insufficient to handle the increased level of waste generated. Instead of being able to handle the LP target of 75% of London's total waste by 2010, 80% by 2015, rising to 85% by 2020, they are projected to be able to handle only 73%, 80% and 83% of the totals in those respective years. Additional waste management facilities to meet additional arisings within London will probably need to be found.

It should be borne in mind that while the Higher Growth and Spatially Constrained Scenarios are projected to increase waste arisings by up to 3% compared with the Base Case, in the latter the Mayor's Strategies are projected to reduce waste arisings by over 10% compared with the Business As Usual scenario over period to 2026. The additional risks generated by the increased waste arisings of the Higher Growth and Spatially

Constrained Scenarios are therefore modest compared with those that might result from failure to achieve full implementation of the Mayor's Waste Strategy itself.

Reduce carbon dioxide emissions

As explained under the Lower Growth Scenario, because of data limitations assessment is limited to comparing the non-transport and public transport elements with output for these elements under the Baseline Scenario.

For the non-transport component (which is likely to contribute up to 80% of total annual CO_2 emissions), annual CO_2 emissions under the Higher Growth and Spatially Constrained Scenarios are consistently higher than under the Baseline Scenario by a percentage increasing to 2.3% by 2026. Furthermore emissions from public transport are roughly projected to be some 7% higher than under the Baseline Scenario whether these two scenarios are compared assuming the full London Plan Transport Scenario network or the more limited Baseline Transport Scenario network. This suggests that it is unlikely that the London Plan percentage reduction targets would be met under the Higher Growth and Spatially Constrained Scenarios, with reduction on 2001 levels most likely limited to less than 13% rather than the targeted 15%.

Increase in energy generated from renewable sources

There is no particular reason why the higher level of population and employment under the Higher Growth and Spatially Constrained Scenarios should either aid or hinder achieving the objective of increasing the amount of energy generated from renewable sources.

Ensure a sustainable approach to flood management

The Baseline Scenario assumes the use for housing of some land at risk of flooding, including areas whose relatively high level of risk has been identified only since the London Housing Capacity Study (2004) was completed. The housing demands of the Higher Growth and Spatially Constrained Scenarios are substantially higher than those of the Baseline Scenario (+180,000 dwellings by 2026) so there would be greater pressure to accommodate more new housing on land liable to flooding, particularly in the Thames Gateway. As well as threatening to reduce the area of functioning flood plains, more intensive development in these areas would tend to increase surface run-off.

Protecting and improving London's heritage and public realm

There is no particular reason why the higher level of population and employment in the Higher Growth and Spatially Constrained Scenarios should either aid or hinder achieving the objective of improving London's heritage and public realm.

5 CONCLUSIONS

5.1 Introduction

This exercise has utilised a number of available tools to test the performance of the Revised London Plan (RLP) against a range of scenarios. Scenarios have been designed that alter the baseline conditions assumed in drafting the RLP. The scenarios were shaped by the scale of key drivers (aggregate population and jobs) and by their spatial distribution. Population projections drew upon GLA's population model, while job projections drew upon a combination of systems developed by the Client and the consultants. The impact of different levels and distributions of population and jobs were tested by TfL modelling to establish how well two network investment plans (Baseline Case and London Plan Case) coped with these numbers. GLA's Enviros model was used to test the environmental impacts of the population, jobs and transport outcomes.

In Chapter 4, the results of these model simulations were used to assess whether under different conditions the Objectives of the RLP were more or less likely to be achieved. It was implicitly assumed that they would be achieved under baseline conditions.

Since little of the models' output provided a direct statement of the various policy indicators (see Table C.2 of Appendix C), the impacts upon the six RLP Objectives had to be inferred. This was done in Chapter 4 on an Objective by Objective basis, assuming that for each Objective all other Objectives were being met. This *ceteris paribus* approach made exposition of the inferential arguments simpler. In this Chapter, we consider how the achievement of each Objective might be affected when the performance against other Objectives is also allowed to vary.

In doing this, we consciously draw upon the scenario evidence as a single body of information, rather than proceed scenario by scenario. This helps us not only assess policy vulnerability but also to indicate broadly measures that might mitigate inadequate performance against the Objectives. We neither question the value judgements that shape the RLP Objectives nor the selection of policy instruments to achieve them. We do, mindful of the risks to the achievement of the Objectives, discuss the implications for the monitoring and managing process.

One uncertainty that runs through the RLP exercise is the inability of policymakers to adequately simulate the social and economic development of London and its responsiveness to policy interventions. Appendix A discusses some of the complexities that would have to be embraced in building such a general equilibrium model[1]. Our scenario analysis and the use of available partial equilibrium models, which cannot hold a two-way conversation, demonstrate that there is a substantial risk of predictive error with and without policy intervention. This is not a reflection on GLA staff and their advisers, but simply an indication of the complexity of designing tools to deal with the ambitions in the London Plan. It follows that not only must monitoring and management systems be equal to identifying and adjusting to shocks and surprises, but also that GLA staff must be supported in developing coherent predictive systems that are equal to the ambitions of policymakers. On the other hand, policy makers cannot wait for such tools to be built and it seems sensible to proceed through the declaration of individual Objectives and the identification of

[1] Waddell P.A., 1997, Household Choice and Urban Structure, Ashgate, Aldershot – provides a useful historical account of attempts to build such models.

interventions to an overall policy, which then has to be monitored and managed as conflicts and constraints emerge.

With or without policy intervention, London would settle into a growth and spatial equilibrium. Some growth paths and equilibria would doubtless be preferable to others. The lack of a coherent system to simulate London's development under changes in conditions and policies also limits what we can say conclusively about the implications for each Objective in the context of the performance against other Objectives.

5.2 Objective 1 Accommodate Growth

This objective is to ensure the space available for London's development is used efficiently, by:

- Increasing the proportion of development on previously developed land
- Increasing the density of residential development, and
- Protecting open space

The most substantial demand on London's limited land resource is from housing. Increases in the number of net additional houses required inevitably place greater pressure on land that offers lower financial returns, particularly community uses such as open space. Greater efforts become necessary to channel residential development into the limited space identified as suitable for housing without threatening the provision of adequate support facilities, by raising densities. Conversely, lower increases in housing requirements are significantly easier to handle.

Under scenarios that increase both job and household numbers, these pressures increase substantially. Redundant industrial land is one of the main sources of previously developed land available for transfer to housing. The need to release additional industrial land (relative to the Baseline Scenario) for a higher housing requirement conflicts with the need to retain for employment purposes a larger amount of industrial land than would otherwise have been released for other uses under the Baseline Scenario. (Under the Higher Growth and Spatially Constrained Scenarios there are estimated to be up to 15,000 more retained industrial jobs by 2026 than under the Baseline Scenario, equivalent to a loss of capacity for up to 4,000 potential dwellings). At the same time, developments to accommodate further office jobs (over 50,000 more under the Higher Growth and Spatially Constrained Scenarios), for which capacity has been identified, will take up space on high PTAL, mixed-use sites which might otherwise have helped offset the shortfall in residential capacity.

More intensive occupation of existing and future employment floorspace could offset some of the shortages in land to accommodate both housing and employment uses. For example, under the Higher Growth and Spatially Constrained Scenarios the additional office jobs could be accommodated in the same land area as the Baseline jobs if the existing office premises were to be occupied at an average intensity 3% higher than at present, through a combination of increases in floorspace worker density, plot ratio and vacancy reduction.

In conclusion, the upward risk assumptions have very substantial implications for the potential future level of London's population, which could rise by about one million between 2006 to 2016, nearly half a million more than under the Baseline Scenario, and by 1.7 million to 2026, nearly 0.9 million more than under the Baseline

Scenario. Accommodating such a rise would create extraordinary difficulties for housing delivery, which would not be feasible without radical change to the current approach (as set out in the Housing Capacity Study) to housing densities, change of use of employment land to housing, and development in flood risk areas.

Competition for land with employment uses (and other uses such as waste disposal – see *Objective 6*) must be considered alongside the potential shortfalls in provision of open space and community facilities necessary to serve the additional population at standards compatible with the Mayor's vision for London as discussed in Chapter 4. It is clear that substantially higher levels of population than currently envisaged would pose a major challenge to the capacity of London to accommodate them and a major threat to the achievement of the London Plan's objectives.

5.3 Objective 2 Better City to Live In

This objective is aimed at ensuring an increasing supply of new and, particularly, affordable homes.

Because of the difficulties they face in accommodating sufficient housing on the available land, higher population and job growth scenarios pose significant risks to the adequate delivery of housing, as the most extensive land use. In practice, this would then tend to limit population growth by discouraging in-migration and encouraging out-migration. The effects on affordable housing delivery would be similar.

The risks to *Objective 3* (More Prosperous City) in the Higher Growth and Spatially Constrained Scenarios, where the higher growth in population than jobs leads to a looser labour market, may also impact on housing delivery particularly in the eastern areas, as insufficient jobs relative to the working population may undermine demand for housing in areas where the largest increases in housing and population are planned. This would be particularly marked in the Spatially Constrained Scenario, where the distribution of new office jobs to the growth areas is reduced. Given the lack of spare housing capacity across London, that would affect the overall delivery in London.

The results from transport modelling in relation to *Objective 5* (Improve Accessibility) are not reliable on a spatial basis and are for all London. Only very limited conclusions can be drawn. Clearly there is a significant risk, in general terms, that issues of capacity and crowding would undermine housing delivery, and hence also affordable housing delivery in the worst affected areas, as this would affect occupier demand and developer confidence. Given the lack of spare housing capacity across London, that would affect the overall delivery in London.

The Higher Growth and Spatially Constrained Scenarios also pose significant risks to *Objective 6* (More attractive, Well-Designed and Green City) in relation to several of the specific targets. Competition for land for waste management facilities and flood risk issues in particular could constrain land for high housing delivery requirements. This parallels the risk in relation to Objective 1 above.

5.4 Objective 3 More Prosperous City

There are three principal prongs to this Objective:

- Increasing sustainability of social inclusion by increasing the proportion of residents working in London;
- Ensure there is sufficient development capacity in the office market
- Direction of economic and population growth to follow sub-regional allocations

In broad terms the Objective is to ensure that space for business growth, primarily offices, is adequate to the unfolding growth in jobs, which business space follows sub-regional ambitions, which have an eastward bias, and that job growth is in some significant measure met from greater labour market participation of residents.

The population levels assumed under the Higher Growth and Spatially Constrained Scenarios require 90,000 extra dwellings by 2016 than under the Baseline. This places considerable pressure on land requirements, including business land (see *Objective 1 and Objective 2*). The RTP exercise identified a considerable quantity of land suitable for business development, which taken by itself seems more than adequate for the business demands considered even under the higher jobs scenarios. Once additional housing demand is introduced into the equation, particularly on the scale envisaged by the Higher Growth and Spatially Constrained Scenarios, it is not so clear that business land will be adequate at assumed densities. The market is only likely to deliver higher densities of development if land prices are higher, which would militate against land intensive uses (e.g. warehousing, some industrial). Some jobs might therefore be priced out.

The scenarios have demonstrated that the desired eastward shift of employment is sensitive to the scale of overall job growth. More growth makes it more likely that jobs will increasingly locate towards the east. Firms and developers will have a natural tendency to congregate around areas where there is already employment mass. The cost of space, accessibility and costs of access will tend to come under pressure in the historic growth areas. Policies 2A.2 and 3B.2 that focus upon expanding and supporting the Central Activities Zone are mindful that space constraints should not threaten existing dynamism. On the other hand, it will be cost pressures on these areas that will drive the search for alternative sites and developments. Guiding London's planning to make business space available and encourage its development outside of the CAZ as well as inside is essential if jobs are to locate increasingly in new areas, particularly to the East. It is perhaps not surprising, therefore, that with greater job growth more jobs will be to the East.

The willingness of firms to re-direct their job locations eastward will be influenced by the evolution of the transport network. Transport improvements do not necessarily support job growth in the areas where the network has been expanded. Workers in the newly endowed area will find that they can now reach better paid jobs at acceptable commuting cost. The corollary of this is that firms need not locate in the newly endowed area to be able to draw on its residents' labour. We could not discover whether congestion was increasing in areas of traditional job concentration as populations and jobs grew such that it would encourage firms to evolve in other locations, perhaps to east London.

The principal influence on participation rates assessed in this exercise is tightness of the labour market. The scenarios suggested that where conditions arose that resulted

in a higher ratio of resident workers to London jobs, that the labour market would be looser, jobs harder to find and wages possibly lower. These circumstances are less conducive to higher activity rates. Participation is likely to increase in the presence of a tight labour market but the extent to which this can arise depends upon the equilibrating forces at work in the London economy.

In any event how marked changes in labour market tightness could occur is difficult to assess in practice with the tools available. All other things being equal a rise in London's wages would tend to attract immigrants and in-commuters as well as increased participation. The opposite would be true if wages fell due to a slacker labour market. In the absence of a general equilibrium model it is unclear how the balance between workers and jobs would tend to be struck in London and how far that balance might vary before automatic features tended to restore a particular balance. It would be quite reasonable to hypothesise that increased working population growth would tend to keep wages low, raise competitiveness and increase investment in more jobs. The pressures on land discussed above could be higher still.

Policies that focus on removing the impediments to work for specific social groups (e.g. women, disabled, BME groups), such as welfare to work programmes, are better suited to raising participation rates than policies within the remit of the London Plan. Adverse labour market problems in London are therefore more likely to be tackled via such policies and supportive macro-economic policy than by spatial policies in the London Plan.

By positing a particular population driven by demographic considerations and jobs on a trends basis (see Chapter 3), our analysis passed the buck to net commuting. If the extended transport networks (*see Objectives 5*) could comfortably accommodate changes in commuting then wages changes in London would be muted by additional commuter flows with direct consequences for participation.

5.5 Objective 4 Social Inclusion

This objective embraces the following:

- Increased employment opportunities for the disadvantaged
- Improving performance against Neighbourhood Renewal floor targets.

As Chapter 4 makes clear it is not possible to infer a great deal from the scenarios regarding the vulnerability of this objective to changing employment conditions. Where labour markets are tighter (*see Objective 3*) the economic environment should be more favourable to meeting the objective and not if the labour market is looser. This happens to be the case in the Lower Growth scenario, since the fall in working population exceeds the fall in jobs, relative to the Baseline. In circumstances of weaker job growth, as under the Lower Growth Scenario, job opportunities to the east are likely to be diminished relatively and this would add importance to the Role of the Olympics in creating jobs in the East from both an economic and social perspective. However, the capacity of the Olympics to create jobs in North East London is limited, with DCMS estimates of 8,000 jobs between 2005 and 2016.

Where there is greater pressure on land from housing (*See Objective 1*), particularly on the scale of the Higher Growth and Spatially Constrained Scenarios, the achievement of floor targets under Neighbourhood Renewal schemes may become more complex to achieve. Pressure on space may make it harder to engineer spatial solutions in otherwise unattractive neighbourhoods. To the extent that higher densities are related to greater levels of crime and anti-social behaviour, then the challenge for Neighbourhood Renewal schemes will be that much greater.

On the other hand, the greater rate of housing new-build and conversions implied by the higher population growth scenarios (*see Objective 2*) may create a greater number of opportunities that Neighbourhood Renewal schemes could exploit. New housing in an area can provide opportunities for complementary works that in conjunction with the new housing can make a large visual impact and perhaps provide economies of scale in addressing security and safety issues. At the same time, the pressure of population growth under the Higher Growth scenario, may well raise housing costs and rent in relation to incomes. There is a risk, all other things remaining equal, that budgets of poorer households will be squeezed as a consequence.

For reasons mentioned earlier it is difficult to speculate on the impact that changes to and pressures upon the transport network (*see Objective 5*) make to issues of social exclusion. All that can be said is that where there are pockets of high unemployment and low participation, improved public transport accessibility increases job opportunities for residents. These opportunities may be through new jobs in the area or access to more jobs outside the area.

5.6 Objective 5 Improve Accessibility

Objective 5 encompasses three core components:

- Reducing the private car share of total trips in London;
- Increasing public transport capacity
- Facilitate growth in Opportunity and Intensification Areas

In order to achieve these goals, Transport 2025 identifies three generic policy categories:

- Getting the best out of the existing system;
- Managing the demand for travel; and
- New capacity

Transport 2025 identifies that a combination of hard and soft transport demand measures are required and intend to introduce such measures. However, it is also evident that without considerable investment in the public transport network in London, the overarching Objective 5 core components cannot be achieved. Indeed, it is apparent that major schemes such as Crossrail and LUL upgrading are required to ensure that the Baseline Scenario employment generation can be fully accommodated. In any higher growth scenario, public transport investment above the Baseline Case will be required in order to achieve the accessibility objectives.

Effectively, the successful attainment of Objective 5 is synonymous with a sustained high level of PT investment over the next 20 years. Growth in public transport has yet to cater for population and employment growth along busy PT corridors. Failure

to provide substantive levels of investment not only prejudices Objective 5 but also the other LP Objectives.

The ability to accommodate growth – particularly in the Higher Growth and Spatially Constrained Scenarios– will be detrimentally affected in the absence of increasing public transport capacity. The threats to *Objectives 2, 3 and 4* similarly include the risk of delivery of inadequate public transport provision.

The linkage between Objectives 5 and 6 basically concerns CO2 emissions. Again, failure to deliver the Baseline Transport Case would certainly impact upon the achievement of modal switching from private car usage and thus have a consequential affect upon CO2 targets at the baseline. Under the Higher Growth and Spatially Constrained Scenarios, the London Plan Transport Scenario would be necessary to reduce CO2 emissions.

In conclusion, Objective 5 facilitates other key London Plan Objectives and thus does not depend upon their attainment. Basically, Objective 5 can only be attained by local and central government (together with private sector investment partially arising out of development gain and the provision of network services) providing sufficient levels of political support and funding.

Objectives such as increasing levels of new homes, accommodating growth, directing growth to follow sub-regional allocations, generating employment in opportunity/intensification areas, reducing CO2 emissions will only be met if the public transport network is expanded within the LP timetable in the appropriate sub-regions. Whilst it is evident that the more prosperous London becomes the greater its ability to provide funding for the public transport funding, Objective 5 'serves' the other Objectives rather than the other way round.

5.7 Objective 6 More Attractive, Well-Designed and Green City

This objective is aimed at maintaining and improving the environment of Londoners and curtailing the environmental impact of London on the rest of the world, by:

- Protecting biodiversity and cultural heritage
- Increasing the amount of waste recycled and managed
- Reducing greenhouse gas emissions
- Improving energy efficiency and increasing the proportion of energy used generated from renewable sources, and
- Ensuring sustainable flood management

Most of the policy vulnerabilities in relation to this objective arise under the higher growth scenarios.

Biodiversity

Increased demand for housing under higher population scenarios could generate pressures to release parts of designated conservation areas for residential use, though presumably suitable mitigation or compensation measures would be required to be put in place. However, the greater levels and intensities of development for both housing and employment uses could have broader adverse impacts on biodiversity by reducing the amount of open land within the built-up area and the continuity of habitats, for example through more intensive development of private gardens for housing and other planted spaces within other types of development.

Waste

If population and job levels were to be significantly higher than those envisaged under the London Plan, additional waste management facilities will probably be required, and sites for these within London will need to be found. The most suitable sites are on land previously in employment use but it is likely to be significantly more difficult to identify additional sites for waste management facilities under a higher growth scenario than under the Base Case Scenario. This is because of the substantial pressure to accommodate further housing requirements on potentially re-usable existing employment land at the same time as higher employment levels would be restricting the level of releases of such land for other purposes. Conversely, waste management targets would be easier to achieve with lower population and job levels.

CO_2 emissions

Chapter 4 concluded that higher than envisaged population and employment scenarios would be likely to threaten the achievement of the London Plan's percentage reduction targets for CO_2 emissions. However, the modelling available for this study assumes the application of the same environmental management measures (either Business as Usual or Mayor's Strategy) at all population and employment levels. It does not allow for the possibility that the generation of higher levels of emissions under a higher population/employment scenario might trigger a demand for and acceptance of more stringent measures to control emission levels. Unfortunately, the model outputs cannot throw any light on the type of measures that would be needed or their likelihood of success.

Flood management

Higher population scenarios place greater pressure to accommodate more new housing on land liable to flooding, particularly in the Thames Gateway. A successful outcome to the policy aim of shifting substantial new employment eastwards in London would further add to this pressure. As well as threatening to reduce the area of functioning flood plains, more intensive development in these areas would tend to increase surface run-off. In the context of rising sea levels caused by global warming the need to respond to such additional pressures on existing and new drainage systems in east London would be likely to significantly raise development costs and potentially reduce the attractiveness of the area to developers, and new residents and businesses.

5.8 Implications for Managing Risks to the London Plan

5.8.1 Plan risks

The Revised London Plan states, in para 6.78, that: '*the Mayor's vision, objectives and policies set out in this plan are based on strong evidence and it seems unlikely that the context in which they have been made will alter significantly in the near future*.' The present study was commissioned to establish nevertheless whether the policies of the Revised London Plan are sufficiently robust to allow the Plan to respond effectively to a realistic range of future conditions that may be substantially different from those under which the London Plan is currently assumed to operate.

By considering the potential impacts on the Plan's performance under several scenarios, the study has drawn attention to a number of risks to the effectiveness of

the Plan's policies in dealing with a range of challenges facing London in its development over the long term.

Some significant risks to the achievement of Plan objectives relate to the delivery of elements of the Plan itself. Under the Baseline Scenario, it is assumed that various policies and actions under the Plan will be fully implemented and that on the whole their outcomes will meet the performance targets set. Thus, for example, the achievement of many of the Plan's objectives depends on the provision of the transport infrastructure networks proposed in the Plan. Similarly, the achievement of most of its environmental targets assumes the full and effective implementation of several of the Mayor's strategies, relating, for example, to waste, energy, air quality, etc. Potential failure of these strategies to achieve their intended outcomes clearly represents a first level of risk to be faced by the London Plan.

The present study has been less concerned with the risks from such failures of Plan delivery than with the risks that might arise if future conditions were to turn out to be significantly different from those currently envisaged. The main variations in possible future conditions explored through the scenarios developed here relate to levels and distribution of population and employment growth. The main risks presented by such different growth scenarios relate to constraints on capacity, particularly of land and infrastructure, to accommodate additional growth, and the possible mismatch between development pressures and available capacity, which may not support the wider objectives of the Plan.

The approach adopted by the London Plan to these and to any other threats posed by changes in the real world to its attempts to achieve its objectives is that of Plan, Monitor and Manage. Para 6.81 states that: '*the plan as a whole, and the targets in Table 6B.1 in particular, will be monitored in the Annual Monitoring Report that analyses the state of strategic planning in London and set priorities for the coming year. …The results could lead to changes in the way the plan is being implemented if this is necessary. For example, there may be a need to adjust … phasing of some elements as a result of changing market conditions or levels of government funding*.'

5.8.2 Assessment of need for Plan changes

Before addressing ways in which the procedures by which the Plan is implemented, monitored and reviewed might be improved in the light of the findings of this study, it is advisable to consider whether any of the Plan's policies present potential weaknesses that need attention in the near future through changes to the Plan itself. This involves answering three questions about risks to the Plan.

- Could any element of the Plan eventually be regretted in view of such risks?
- Could anything be done to avoid the circumstances giving rise to the risks?
- If not, could anything be done to mitigate their potential impacts?

Q1. Potential regrets about Plan elements

The first question seeks to identify any components of the Plan whose adoption and implementation would be likely to be regretted if future conditions were to turn out to be significantly different from those currently envisaged. In other words, is it possible to foresee whether implementation of any of the plan's policies or targets might be found, in a future different from that assumed, to have made it more difficult to deal with the challenges then facing London?

From our work, we have identified a number of aspects of the London Plan whose implementation may make it more difficult to respond to future challenges that might arise under reasonably plausible scenarios. These arise particularly from the potential difficulties of accommodating higher than envisaged levels of population and jobs in the city.

(a) Residential densities.

Should it become desirable or necessary to accommodate substantially higher household numbers than are provided for under the London Plan, it may eventually be found that the application of residential densities according to the London Plan density matrix will have led to under-use of the limited land area available for housing, such that very much higher densities would need to be adopted on remaining development opportunities.

(b) Housing targets

Should it become desirable or necessary to accommodate substantially higher household and job numbers than are provided for under the London Plan, it may be found that:

(i) the use of almost all available land for housing will have undermined the capacity to provide community facilities and open space at appropriate levels

(ii) in particular, the substantial transfer of land from employment uses to housing, will have restricted the future potential to accommodate new employment uses, waste management facilities and other uses required to meet the needs of the higher population, and

(iii) the achievement of sustainable drainage patterns in areas at risk of flooding in east London may be prejudiced, particularly in the context of rising sea levels due to global warming.

(c) Support for Further Development of the CAZ

Should job growth be weaker than projected the opportunity to push job growth eastwards also seems likely to be weakened. The support to the expansion of capacity in the CAZ will tend to reduce pressures on firms to look elsewhere for business space. On the other hand, the continued growth of businesses within the CAZ, will be supportive to job creation elsewhere in London. Thus on both accounts eastward development would be weakened by weaker growth. Extension of the transport network eastward may not be a sufficient condition to ensure that jobs move in that direction too. Indeed there is a risk that workers may use the network to seek jobs in the CAZ. This not only increases the economic mass of the CAZ but also encourages the arguments for ever greater densities. It may become a matter of regret that while seeking to sustain the CAZ it becomes an impediment to eastward expansion of jobs and encourages a pattern of commuting that is less environmentally sustainable.

Q2. Risk avoidance

The second question above asks whether anything in the Plan could be changed to lessen the likelihood of these potential future conditions arising and if so whether the risks and the potential costs of such changes would justify them being made. If the undesirable future conditions that might arise could be warded off by action taken in advance, the desirability of undertaking that action will depend on: the likelihood of the conditions arising, the potential costs of countering them, and the likelihood of success of the actions taken. The costs would involve not just the resource costs of action but also the opportunity costs of pursuing a course that might turn out not to have been needed.

In response to this question, it would appear unlikely that any provision of the London Plan could prevent the development of conditions under which London would be subject to substantially increased pressures to accommodate additional housing and jobs beyond those envisaged by the London Plan. Such conditions would arise from international or national developments beyond the control of the authorities in London. Any measures which in theory might be adopted to discourage such further growth, for example by raising the costs of households living or businesses operating in the city, would almost certainly prejudice the achievement of improvements to the city which are central to the vision of the Plan under what is now considered the most probable scenario.

Q3. Impact mitigation

The third question above asks whether, if it is not considered feasible or desirable to take action to counter the development of such conditions, any changes could be made to the Plan to facilitate accommodating their impacts. If so, it needs to be established whether the risks are sufficiently great and the costs of accommodating their impacts sufficiently low to justify making such changes.

Most of the risks of major concern arise in the case of higher growth scenarios and relate to limitations in space and infrastructure capacity to accommodate housing, jobs and supporting facilities. Mitigation in these cases involves adopting measures to increase space capacity, mainly by applying increased densities or bringing into use previously protected land. An obvious danger with such a response is that while it is intended to be a fallback position in the case of higher than expected growth, it could tend to invite the higher growth levels, regardless of whether these are desirable. Even if this did not occur, the costs of adopting a capacity expansion approach would still have to be borne. These might include:

- in the case of raising densities, the impacts of higher land values and costs of development, which may tend to price out uses with lower returns (especially affordable housing, industry and warehousing)
- catering for additional localised demands on existing and planned infrastructure networks
- provision of additional flood protection measures
- challenging public acceptance, for example, of higher densities or potential release of part of the Green Belt

Our overall conclusion from this discussion is that none of the matters identified in this study are such as to justify immediate change to the content of the London Plan. The Plan's adoption of the Plan, Monitor and Manage approach is the most appropriate way of dealing with any such risks. This leads directly to consideration of

whether there are any potential improvements that could usefully be made to the monitor and manage process set out in Ch 6 of the LP in the light of the consideration of wider scenarios.

5.8.3 Plan, Monitor and Manage

Approach

Keeping a strategic plan on target and appropriate to circumstances requires regular monitoring of:

a) implementation of development decisions, to establish whether the plan is being followed. In the London Plan monitoring process, this is covered by *process indicators.*

b) outcomes, to establish whether the plan's policies are proving effective at achieving their objectives. In the London Plan, this is covered by *performance indicators*, comprising *performance measures* and *targets*.

c) assumptions, to establish whether these remain suitable as a basis for planning the future. In the London Plan, this is partially covered by *contextual indicators*, which measure influences which the plan influences but does not directly control

As the present exercise is concerned with the impact of changing assumptions on plan performance our concern is mainly with the monitoring of outcomes and assumptions and particular whether the indicators adopted for the London Plan are sufficient to give warning of policy failures or weaknesses that may require amendments or readjustments to the Plan. The study indicates that a proper understanding of the implications of trends in important contextual variables is critical to judging whether the Plan is likely to continue to deliver good performance against its objectives in the longer term. There is therefore a need to monitor, not just the current values of indicators, but also their forecast values. It is important to know not just whether the plan is currently on target but whether it can be expected to remain on target, i.e. to monitor the results of projections reflecting changing trends in order to foresee their potential impacts and decide how to respond to them.

Modelling requirements

This aspect of monitoring places substantial demands on the modelling capability available to the GLA. There are fundamental difficulties in the way of analysing consistently the decisions of households and businesses to locate where they do and then predicting how those decisions would change under altered external conditions or policies. This problem of producing coherent demographic and job projections is not a problem for London alone. The recent East of England Examination in Public on their Regional Spatial Statement was much exercised by the same problem.

In some world cities, attempts have been made to develop general equilibrium models that seek to capture internally the spatial interactions between migration, wages, house prices, job creation, business rents, commuting, planning instruments and network capacities. However, this is no easy task and no model will ever provide a panacea for policy formulation.

The GLA has therefore wisely separated its analysis tools into manageable segments based on a number of partial equilibrium modelling systems. However, these

independently developed systems have been designed for separate and specific purposes and do not always work well together. Designing a system that would allow easier and more effective iteration between the various models used in this exercise would help. In this way, the failure of partial models to handle important feedback mechanisms can to some degree be sidestepped. The demographic, economic, transport, environmental and other models need to be managed so that results can be fed back more readily in order to modify original assumptions. Where necessary, modifications may need to be made to the models to allow more effective iteration. In some cases smaller and simpler models designed for an iterative process may need to be built that provide better insight into broad strategic issues, rather than use large models designed to provide detailed output intended for other issues.

One critical issue identified in the present study is how to reconcile the multiple demands placed on London's limited land resources in the face of an inevitably uncertain future. This has major implications for key policy areas, including land allocations for different uses and the densities at which they should be developed. Separate studies have been undertaken on the space requirements of housing and of employment uses and a reconciliation exercise between the two sets of demands carried out to confirm the Baseline Scenario can function adequately. However, such reconciliation is needed to take account of the need for other key uses of urban land, especially community facilities and open space. It would be desirable to incorporate these within a single flexible model that could assess the adequacy of land and density provisions to accommodate different levels of jobs, houses and facilities. This would ideally be GIS based. The London Housing Capacity Model provides a starting point. It also has scenario analysis capabilities that should allow it to be used as a more central tool in spatial planning in London, for example by increasing its interaction with transport models

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Chinese

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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

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.

Bengali

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

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.

Urdu

اگر آپ اِس دستاویز کی نقل اپنی زبان میں چاھتے ھیں، تو براہ کرم نیچے دئے گئے نمبر پر فون کریں یا دیئے گئے پتے پر رابطہ کریں

Turkish

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

Arabic

إذا أردت نسخة من هذه الوثيقة بلغتك، يرجى الاتصال برقم الهاتف أو مراسلة العنوان أدناه

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:

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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