ATKINS

FUTURE PROOFING LONDON

Our world city: risks and opportunities for London's competitive advantage to 2050

CENTRE FOR LONDON

OXFORD ECONOMICS

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About the project partners

Atkins

Atkins is one of the world's leading infrastructure and design companies, with the depth and breadth of technical expertise to respond to the world's most complex infrastructure and environmental challenges. These include responding to the increasing rate of urbanisation and the urgent transition to a low carbon economy. Atkins works with municipal authorities, national and regional government, development agencies, private sector companies, and other stakeholders to develop and implement strategic plans and investment projects to shape and manage the future growth of cities.
With over 17,000 employees worldwide, Atkins is able to bring together its technical knowledge across a wide range of disciplines such as transport, water, energy, design, architecture, climate science, ecology, planning, and economics to help cities and those investing in them to act upon the long term opportunities and challenges of resource use and a changing climate. Our international work spans Africa, Asia, Europe, the Middle East and North America.

Centre for London

Centre for London is a politically independent, not-for-profit think tank focused on the big challenges facing London. Through its research and events, the Centre acts as a critical friend to London's leaders and policymakers, promotes a wider understanding of the challenges facing London, and develops long term, rigorous and radical policy solutions for the capital. It looks for support from a mixture of private, voluntary and public sector funders and works collaboratively with its supporters, drawing on their experience and expertise. Launched in 2011, the Centre is quickly developing relationships with sister organisations across the globe. Find out more about our work at: www.centreforlondon.org.

Oxford Economics

Oxford Economics was founded in 1981 as a commercial venture with Oxford University's business college to provide economic forecasting and modelling to UK companies and financial institutions expanding abroad. Since then, we have become one of the world's foremost independent global advisory firms, providing reports, forecasts and analytical tools on 200 countries, 100 industrial sectors and over 3,000 cities. Our best-of-class global economic and industry models and analytical tools give us an unparalleled ability to forecast external market trends and assess their economic, social and business impact. We employ over 130 full-time people, including more than 90 professional economists, industry experts and business editors - one of the largest teams of macroeconomists and thought leadership specialists.

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EXECUTIVE SUMMARY

Future Proofing London

What kind of city do we want London to be in 2050 and beyond?

This is a fascinating question for us as we have been and are a part of London's development since our founder Sir William Atkins worked on the design of Battersea Power Station in the 1930s. We work here, we travel within and to and from London, we use and support its educational and intellectual institutions and enjoy the cultural, business and sporting opportunities in this amazing city. We care deeply about how well London works for people now and for the future.

London is a unique city with a rich and diverse heritage, a thriving economy, first class cultural and educational institutions all of which make it a successful world city, but will this continue? Is London a victim of its own success? It is growing at the fastest rate for 80 years. London has some of the oldest infrastructure in the world still in operation. Managing the renewal and replacement of this infrastructure in the timescales required and to meet the capacity of its rapidly rising population is the key challenge for London's planners and policymakers.

From our research, we have predicted that London's population will be over 12 million by 2050. How this population increase is accommodated, equality of access to opportunities, rapid intelligent technology development, economic and environmental change, all present urgent risks and also opportunities for future proofing London if we act now. Failure to meet these risks will put London's competitive advantage and quality of life at risk.

The Future Proofing Cities approach

Future Proofing London is part of Atkins' Future Proofing Cities programme. It uses a methodology Atkins has developed to identify risks that will affect London by diagnosing issues across the inter-connected spheres of housing, economy, society and environment and developing potential solutions that cut across these spheres. By considering risks in this connected way, our approach can successfully work to future proof London.

The Future Proofing process was developed by Atkins, UCL and the Department for International Development in 2012, and can be embedded into how we plan and respond to challenges in developed and developing cities now and in the future. The process follows a systematic approach from diagnosis of risks and considering the capacity the city has to act on those risks, to potential solutions that will help the city to manage the risks and deliver quality of life improvements.

We have been supported in our Future Proofing London work by Oxford Economics who provided detailed demographic and job forecasts for London, and Centre for London who considered how infrastructure can be developed in a more socially inclusive way.

The risks to London's competitive advantage

London is one of the most competitive cities in the world and compares well on a range of measures to other global cities such as New York, Paris and Tokyo. However, the global economy is changing with a shift in power to cities in Asia and London risks losing its competitive advantage.

If London loses its competitive edge, this will harm the UK economy because London creates a significant share of the UK's wealth and jobs. Our research indicates the scale and pace of population growth in London is much greater than previously envisaged. London is not planning properly for this rapidity.

If London is to realise its economic growth potential and maintain its competitive advantage it will need to deal with four inter-connected risks we have identified:

Risk 1: London fails to meet its housing needs – which is impacting on the ability to attract people to work in the city.

Risk 2: London's economy becomes unbalanced – the economy is in danger of losing the diversity that has enabled it to prosper.

Risk 3: London's society becomes more unequal – poverty is being suburbanised with wealth concentrated in the centre. There is a danger that if this continues social tensions will rise and impact on London's stability.

Risk 4: London's environment becomes more degraded – as London continues to grow, environmental problems are impacting on quality of life. The City continues to rely on sources beyond its boundaries for its energy requirements and waste management.

The city has the opportunity to deal with these four risks through new approaches to the planning and management of the city. This will help to put London in the best possible position to maintain its competitive advantage over other cities. We believe a transformed approach to how we plan for future growth and how we deliver the infrastructure to support that growth will help to future proof London.

These risks should not be seen in isolation as there are interdependencies and connections between them. Our Future Proofing London approach assesses risks in an interconnected way that enables potential solutions that offer multi-dimensional benefits to be developed.

The importance of London's competitive advantage

London is a leading global financial centre and consistently ranks in the top two in terms of global competitiveness. London's economic success has been built on its ability to successfully attract business, investors, talented individuals and visitors as one of only a handful of truly world cities.

London, like other global cities, has built its competitive advantage as a result of a range of factors that allow the city to make the most of the access to the global markets that it already benefits from. Other cities could also acquire these factors in order to compete with London and other cities. Factors such as stability; attractiveness to talented people; world class infrastructure; diversity in the economy and global brand are threatened by the key risks of housing, economy, society and environment. If these factors are put at risk London's competitive advantage will diminish.

London is crucial to the economic prosperity of the UK, with much of the recent economic growth generated in the UK being driven by London. London has a significant share (22%) of the UK's Gross Value Added (GVA), and GVA growth rates in London have outstripped the rest of the UK over the past 20 years. Employment growth rates in London over the past 20 years have been double the national average. London is also important to the UK because of the type of jobs that it generates. It is the leading centre for high value, export oriented service sector employment.

Any risks to London's competitive advantage is an issue not just for London's continued growth but also for the economic success of the UK as a whole.

Scale and pace of change

Oxford Economic forecasts suggest the scale and pace of London's growth is much greater than envisaged in both the London Plan and London Infrastructure Plan (2050). Oxford Economics forecast that the population is set to reach 12 million by 2050 compared to the 11.3 million projected in the London Infrastructure Plan. The London Infrastructure Plan forecasts jobs to reach 6.3 million by 2050, a level that Oxford Economics forecasts will be surpassed by 2026.

If the projections that underpin London's strategic and infrastructure planning are underestimating the level of growth likely in the city, London will fail to plan properly for its growth and this growth trajectory will exacerbate the risks we have identified.

Scenario 1. A London that has lost its competitive edge...

We have analysed the possible development of London over the next three decades through two broad scenarios described below. These scenarios have been created by our research. The first scenario highlights how London could look if the risks are not addressed, whilst the second identifies an alternative view of how the city might look like if the potential solutions to the risks are implemented. There are of course a multitude of lenses through which we could view the future of it, but we believe the interplay between infrastructure and social and economic development is crucial to how London will look in the future.

London's major Opportunity Areas have been developed in a traditional way that perpetuates the patterns of development that have prevailed in the past 20-30 years. This is a London based on 'big bang' development and large scale infrastructure projects that are less flexible and adaptable to the future economy and environment. Infrastructure investment has continued to focus on grand projects often at the expense of alternatives that are less imposing and have more wide ranging benefits. Development addresses only a limited range of employment sectors and fails to provide an adequate mix of housing to accommodate a diverse range of people. Development continues to be dominated by cars and fails to provide good quality networks of green infrastructure and public realm.

A continuing undersupply of housing has driven the cost of central London real estate beyond the reach of all but the wealthiest, forcing an increasing number of people to find homes in outer London or elsewhere. The cost of living rises considerably driven by house prices. Those that can afford a home often find they have to live in overcrowded accommodation which is having a severe impact on health and quality of life.

Inequality continues to grow and is resulting in social unrest, which impacts on London's reputation as a safe and stable city. Social mobility becomes increasingly restricted affecting human capital which in turn is acting as a barrier to developing talent and innovation. A growing number of people can't access the common wealth that London has to offer, which is having implications for people's happiness, wellbeing and health.

The economy becomes focused on a narrow range of sectors making finding a job for those with fewer skills increasingly difficult. Employment continues to agglomerate in central London, forcing commuters to travel from ever increasing distances to access jobs. London's transport infrastructure is placed under ever greater strain to cope with the demand for commuting. Much of London's industrial land has been converted to residential or other uses, meaning those businesses that support the London service economy cannot find premises and this is limiting growth.

The impacts of climate change including increased flood events, extreme weather (droughts and storms) and increased temperatures are now common in the city. Damage to homes, businesses and critical infrastructure is significant and proving costly to the economy by placing additional costs on businesses and dissuading investment in the city.

The city has failed to deal adequately with air quality issues and this is having economic consequences as poor health is impacting on productivity, and a generally poorer environmental quality is impacting on labour supply.

What does this mean for London's competitiveness?

- The city is less resilient and more prone to global economic shocks as the economy is less diverse.
- Development is designed to accommodate the current needs of business rather than planning for a more technically advanced future economy that has different requirements.
- Infrastructure investment has had a limited impact on social and environmental issues and as a result the city is a less attractive place to live, work and invest.
- Rising social unrest as a result of inequality impacts on London's ability to attract investment and talented people.
- Expensive infrastructure investments are required to maintain the spatial structure of London.
- A lack of social mobility is impacting on innovation in the economy.
- The economy becomes less diverse as growth sectors find it hard to find talent and accommodation, which reduces London's ability to adapt to future changes in the global economy.
- Environmental issues such as flood events are adding to business costs and placing critical infrastructure at risk.
- Poor air quality is effecting people's health which in turn is impacting on productivity.

Scenario 2. London 2050 an alternative vision...

London has made some bold decisions to help tackle housing undersupply. This includes making limited use of the Green Belt to deliver housing and making use of infrastructure to unlock development potential particularly in outer London. This is helping to provide much needed homes across all sections of society. The focus of economic activity has spread from established centres. Outer London has been revitalised through a programme including investment in orbital transport improvements (public transport and cycling), densification of suburbs and a redefined economic and social role for outer London centres. The focus on revitalising outer London has helped to tackle issues of inequality by providing employment opportunities for a mix of Londoners.

Outer London is the place to kick start new high tech industries such as micro-manufacturing and allows greater flexibility to repurpose outdated office and retail accommodation to reinvigorate centres and allow them to adapt to new working and shopping patterns. There will be housing for all and outer London will also have improved parks, museums and theatres. Improvements to low cost transport will have been implemented allowing better access to cultural assets in central London. Infrastructure prioritisation will be focused on those people in most need.

London's major Opportunity Areas have been developed in a more responsive way to meet the needs of a changing economy and has boosted London's resilience to risks. This is a London based on Curated Clusters designed to be more flexible and adaptable to the future economy and environment. Curating uses latest technology to continually manage the life and needs of the cluster. It is a London that supports a diverse society and economy. Comprehensive networks of green infrastructure and public realm and a car-free environment have helped to create a high quality of life which is key to the city's success.

London is better adapted to the risks of climate change, helping to minimise damage to homes, businesses and critical infrastructure. The city has taken major steps to improve air quality, which has improved health and quality of life.

What does this mean for London's competitiveness?

- The city is more adaptable to the changing global economy and is continually curated to retain London's competitive edge.
- Development has focused on achieving a high quality of life by being green, car-free, and more people oriented. This makes London attractive to investors and workers.
- A more considered infrastructure investment programme based on a need to deal with the risks that London faces means investment in infrastructure is based on projects offering the greatest social, environmental and economic benefits.
- London becomes more socially equitable and remains a stable place that is attractive for talented individuals to live and work.
- London enables a wide range of sectors to thrive including emerging growth sectors making the economy diverse and resilient.
- Housing availability and affordability issues are tackled through more efficient use of land allowing London to continue to accommodate those that want to live and work in the city.

Capacity to act

The extent to which London's competitive advantage will be threatened by the risks we have identified will depend on London's capacity to act. London's capacity to respond to the risks is determined by the strength of governance; the effectiveness of urban planning as it plays a key role in shaping and controlling land use, urban form and infrastructure delivery; the role of partnerships between the public and private sectors; the ability to marshal finance to help deliver investments that respond to current and future risks; and a strong economy.

The city has the opportunity to develop an approach to planning growth (as set out in our potential solutions) to deal with the four risks (housing, economy, society and environment). This will help to put London in the best possible position to maintain its competitive advantage over other cities. We believe a transformed approach to land use planning and infrastructure planning will help to Future Proof London.

Planning and investment in new or upgraded infrastructure provision will be crucial to delivering a city that can tackle the risks to London's competitive advantage. The London Infrastructure Plan 2050 has identified over £1 trillion of infrastructure investment is required to meet London's future needs and has raised questions about the shape of London's long term growth. Development of infrastructure can help to reinforce existing trends and will shape the structure of the city for the foreseeable future. So it is crucial when planning infrastructure investment that we consider the links between infrastructure and:

- delivering housing
- economic outcomes
- social outcomes
- environmental outcomes.

If London is to deal with the risks to its competitive advantage, the current approach to planning land use and infrastructure will need to be fit for purpose.

Potential solutions

London's competitive advantage is at risk arising from the key issues of housing, economy, society and environment. There is a range of ways in which London must address these risks. We focus here on planning as the issue that London has most control over at present, and because planning helps to deliver much-needed housing, jobs and environmental stewardship, which in turn are key to London's success in terms of liveability, prosperity and resilience. If London deals successfully with the risks it can help the city retain its competitive advantage, but also it provides an opportunity to create a better London.

How can we get there?

We propose some bold new approaches to planning and infrastructure which can help safeguard London's competitive advantage and help London on a path to a resilient future. These proposals relate to specific places currently earmarked for significant new development and they relate to land use planning across the city and at London's boundaries.

Prioritising infrastructure investments to be more inclusive – this means adpating how we choose to invest in infrastructrue so that the social and environmental benefits are just as important as the economic benefits.

A major strategic programme to revitalise outer London – by revitalising outer London we can make this part of the city work harder to deliver much needed housing and a diverse range of jobs, improve on social equity and create a better quality of life.'

Opportunity Areas reimagined as 'Curated Clusters' – This is a more adaptable and responsive approach to major development areas that provides an opportunity to nurture economic growth sectors and create diverse communities that last.

A strategic approach to green infrastructure – this will enable the city to make the best use of its green infrastructure whilst creating opportunities for housing delivery and environmental improvements.

The solutions are cross cutting and can help to minimise the four risks.

Prioritising infrastructure investments to be more inclusive

To improve the effectiveness of investment in infrastructure to deliver greater economic, social and environmental benefits. To help tackle the rise of inequality, London needs to be planned for the benefit of all Londoners. London wide infrastructure investments have to a large extent focused on big infrastructure projects that help to reinforce the existing spatial structure of London. There is a need to change infrastructure investments to:

- give a clear priority to the issues that outer London is facing
- target infrastructure investment directly at those who are currently least well served
- local authorities and other public bodies should develop prioritisation tools to channel infrastructure funding to the most deprived areas.

The London Infrastructure Plan 2050 is London's first attempt at coordinating the planning and delivery of infrastructure across the city. However the risks to London's competitiveness could be tackled through improved infrastructure planning that incorporates the following:

- better appraisal and design of infrastructure projects that incorporate a wider range of benefits (social and environmental) so that decisions around where to make infrastructure investments or which option to use can help to address the risks London faces

- an ecosystem services valuation approach so we can ensure that we do not under invest or over exploit our environment
- coordination of planning with the wider region beyond London's boundaries
- new methods of data collection and analysis and making use of big data collection and analysis to improve the way London plans its land use and infrastructure provision.

A major strategic programme to revitalise outer London

To help tackle London's housing need, the imbalance in London's economy and the risk of rising inequality, outer London centres need to be revitalised. This can be achieved through:

- creating connectivity for all through new and upgraded transport infrastructure
- densifying existing suburban housing areas
- repurposing the office stock to meet housing needs and to reflect changing working practices and growth sector requirements
- help outer London become the micro-manufacturing excellence hub driven by new technology such as 3D printing
- support the transformation of out-dated retail spaces to a wider range of uses
- flex the planning system to allow a speedier response to market conditions
- improve access to the 'common wealth' of London for all Londoners.

Opportunity Areas reimagined as 'Curated Clusters'

London's Opportunity Areas are all crucial to the delivery of a high proportion of London's future housing and jobs. However previous 'mega projects' in London have proved to be inflexible to changing economic and technological circumstances. As much of London jobs growth is forecast to be in creative and technology sectors, areas planned around the needs of financial services will not be in tune with London's changing economic structure.

A more future-proof solution to London's strategic land development could be 'Curated Clusters' - urban places of distinctive character and high quality of life, containing a flexible and adaptable mix of residential, commercial, retail and services, maximising the appeal to a variety of industry sectors as they emerge and evolve. The curators will vary from place to place, but will often include a similar set of stakeholders including the local authority, key land owners, public service providers and most importantly the community and businesses within the area.

The growth of data availability and mobile technology will allow the creation of digitally enabled communities that can help to continually curate the clusters from the bottom up and enable them to remain places that are adaptable to changing needs.

We define **'Curated Clusters'** as places that:

- provide adaptable business space
- provide affordable business space
- provide a mix of employment opportunities
- incorporate place making by retaining the best of existing heritage and culture
- develop mixed communities that are built to last
- develop a mix of uses that balances jobs with homes
- enable continual curation through imaginative use of live data and mapping tools
- provide local retail and leisure space that adapts to the changing trends in retail spending
- co-locate services in a creative way
- provide car free environments
- create a high quality of life through public realm and greening
- manage green space through green space trusts.

A strategic approach to green infrastructure

London is known globally for its sumptuous green and open spaces. As London grows, these assets will be ever more essential for residents and visitors, and London's future resilience will need more green spaces. London's clear lack of supply of suitable land is one of the key obstacles to housing Londoners to the standards that befit a World City. Brownfield land first is the top priority for delivering more housing. But given the rapidity of population growth that we have identified, it is also time to critically address the Green Belt. However, the Green Belt should not be viewed in isolation. It is part of London's strategic green infrastructure network and should be considered as such. This includes:

- a pan London strategic review of Green Belt enabling some land to be developed for housing
- making better use of existing Green Belt so this valuable resource is more accessible to the public as an environmental and leisure resource
- strategic land swaps enable housing delivery and boost the cities resilience to climate change
- provision of new green infrastructure using innovative solutions to create more space for London's growing population
- green infrastructure trusts to allow the community to manage and maintain green infrastructure on behalf of all Londoners.

Camley Street 2015

Camley Street Natural Park - Two acres of nature reserve lie between London's busy rail stations – Kings Cross and St Pancras. The park was an old coal yard until 1984, and is an important example of the re-use of brownfield land to create urban green infrastructure in the heart of the capital.

New partnerships and delivery models

As a world city London has a high capacity to act to address the challenges highlighted in this report. However, the range and complexity of challenges spans institutional and traditional sector silos and requires multiple institutions and actors to agree and align their activity. While London is not alone in this challenge, several gaps have emerged across governance, powers, finance and coordination of delivery which need to be addressed to unlock delivery.

Proposals include:

- taking a more programmatic view of infrastructure and regeneration proposals to realise the synergies and benefits of a more holistic approach to delivery
- developing a long term and viable financing model to unlock opportunity areas
- easing the assembly and delivery of sites for development. One of the barriers to substantially increasing housing delivery is the need to assemble land from multiple owners and incentivise development of land. London should explore the potential of land pooling/readjustment and a levy on undeveloped land to speed up the delivery of complex sites and unlock housing delivery and

We have already highlighted the opportunity of partnerships including Curated Clusters to unlock economic potential and a London Green Infrastructure Trust to deliver major improvement in public space provision. A range of other opportunities focused on new forms of partnership and delivery mechanisms could help to unlock delivery of homes and jobs in London.

- harnessing the potential of London's public sector land and property to bridge the development gap including wider use of Local Asset Backed Vehicles and Land Value Capture
- supporting greater devolution of fiscal mechanisms. Retention of Stamp Duty Land Tax and extending the terms of business rate retention would further incentivise Boroughs to pursue growth and fund the extension of public services to match an increasing population
- matching opportunities to finance. Explore the potential to set up a London investment platform to match a range of different sources of finance in support of projects.

ANNUAL PASSENGERS (HUB AIRPORT)

73.4m

Professional, scientific and technical services

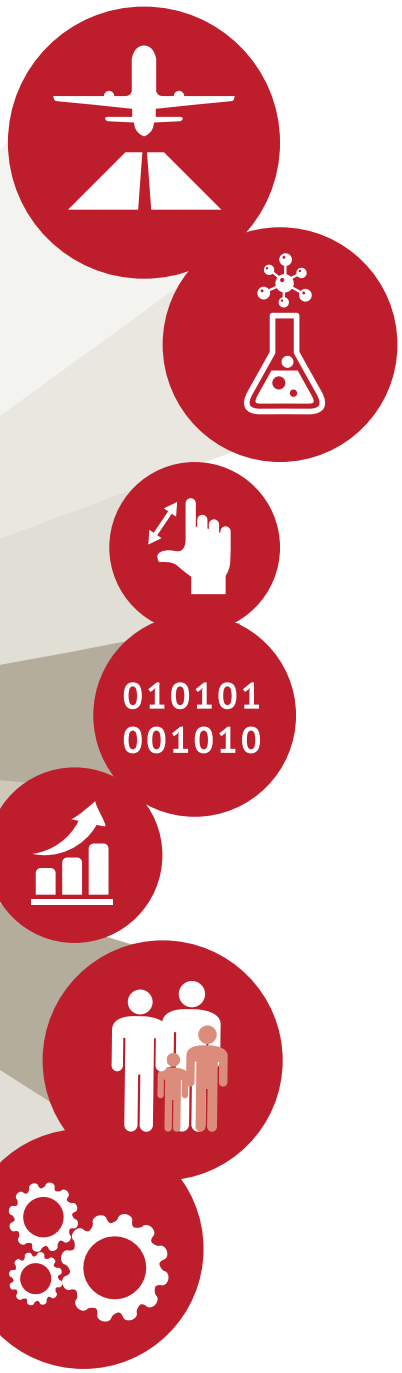
28% of total **job growth** between **2015 and 2036**

London's GVA will grow by

£286 bn by 2036

Ave. annual growth

Information and communications **4.3%**



Population is set to reach

11.1m by 2036

& if London continues to grow at this pace the population will be in excess of

12m by 2050.

3 Universities in World Top 50

Graduates as share of population **53%**

What does Future Proofing London mean to me?

London currently has a competitive advantage over most if not all the leading world cities. This success is of great importance to both the city itself and the UK as a whole. However, the city's success comes with additional pressures from population and jobs growth that need to be addressed through new housing development and supporting infrastructure. London's competitive advantage is at risk for various reasons. Some are beyond the city's direct control, while others are related to how it plans for growth.

Our Future Proofing Cities approach identifies risks and suggests solutions that are relevant to a variety of stakeholders, who will also be interested in our methodology.

Future Proofing London is important for:

Government in its role in helping to deliver a supply of housing to meet London's future needs and to help tackle housing affordability issues; helping to maintain a balanced economy by retaining land for employment uses and support growth sectors; assisting social equity by helping to provide infrastructure in a more equitable manner; and promoting a more environmentally sensitive approach to development and infrastructure planning.

Businesses because they need to continue to attract investment and a skilled labour supply to ensure they can thrive and grow.

Developers in their role in delivering a supply of types and tenures of housing to meet London's future needs and to help tackle housing affordability issues; helping to maintain a balanced economy by developing commercial premises that meet London's changing economic needs; assisting social equity by delivering social infrastructure alongside their housing and commercial developments; and delivering a more environmentally sensitive approach to development.

Infrastructure providers in their role in delivering infrastructure that helps to unlock housing supply; delivering infrastructure to support a balanced economy; assisting social equity by delivering social infrastructure; and delivering infrastructure that is future proofed for changing environmental conditions.

Other World Cities that will be dealing with similar pressures. The Future Proofing Cities approach is relevant and applicable to cities world-wide as they plan for significant future challenges.

We welcome your comments and thoughts on our ideas and findings in this report. Please contact Richard or Janet in our London office on the contact details below, or email fpc@atkinsglobal.com Follow us on Twitter @fpcities and see our website www.atkinsglobal.com/fpc

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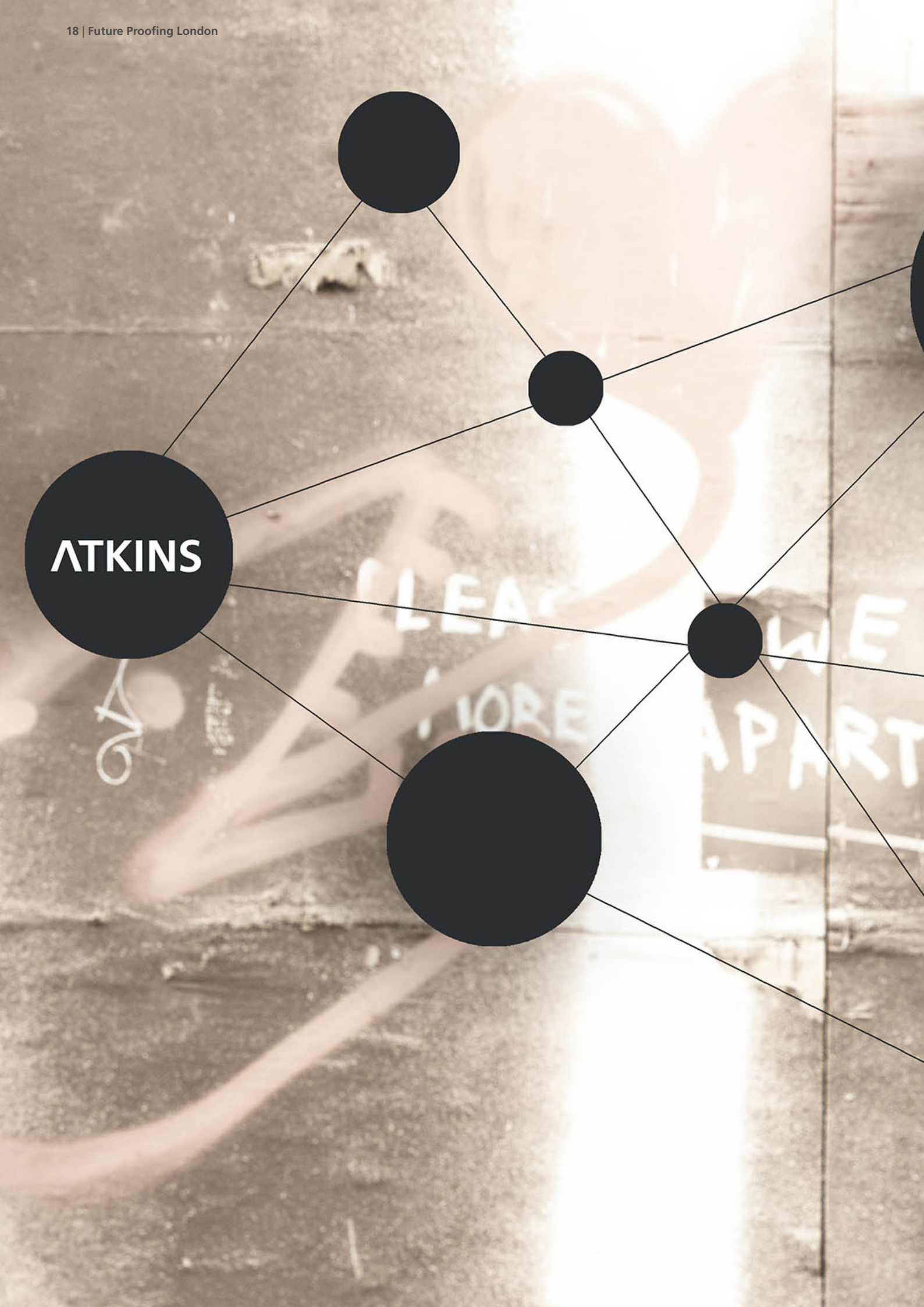
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FUTURE PROOFING LONDON

01

INTRODUCTION

Introduction

This report is the culmination of twelve months' research by Atkins. We have been supported by Centre for London and Oxford Economics. Our aspiration is to provide an approach for London's future that will allow London to manage growth in a way that is inclusive and helps London to maintain its competitive advantage as a world city, whilst ensuring that quality of life for Londoners is improved and environmental impact is minimised.

Why does this report matter?

London is crucial to the economic prosperity of the UK, with much of the recent economic growth generated in the UK being driven by London. This growth is the result of London's attraction in a global context for business, investors, and talented individuals as one of only a handful of truly world cities.

But London is at a turning point. Its population is growing at its fastest rate in 80 years which, when combined with rapid changes in its economic and spatial structure, is creating severe stress on the infrastructure and housing stock. If this is not addressed urgently, London will face significant risks to its quality of life, its attractiveness as a world city and the pace of economic growth.

There are many risks that could affect London's competitiveness, however this Future Proofing London report focuses on those risks that could be managed through land use planning and infrastructure planning. This report identifies four risks which will have an impact on London's competitive advantage:

- London does not meet its predicted housing needs
- London's economy fails to provide opportunities for all Londoners
- London's society becomes more unequal
- London's environment becomes more degraded as a result of growth.

These risks are interconnected and they will require a coordinated approach to land use planning and infrastructure planning. This report provides new solutions which respond to these risks in an integrated way.

This report considers London's capacity to act to meet the challenges ahead. We look at the institutions and structures that are in place to govern, plan, deliver and finance growth and infrastructure investment.

The GLA's London 2050 Infrastructure Plan (March 2015) has identified over £1 trillion of infrastructure investment is required to meet London's future needs and has raised questions about the shape of London's long term growth. But there are many unanswered questions about the social, environmental and economic implications of the proposed investment. The infrastructure that we build now will shape the structure of the city for the foreseeable future, and may lock-in some negative trends. So it is crucial when planning infrastructure investment that we build in the social, environmental and economic outcomes we want to achieve from the outset.

Meanwhile the London Plan[1] only looks to 2036, and takes what could be considered a 'business as usual' approach to development. There is a need to explore more radical, long term options, particularly with regard to infrastructure investment to create a city that is prosperous, inclusive and minimises its impact on the environment.

What do we mean by Future Proofing London?

Future Proofing London is an approach Atkins has developed to identify risks that will affect London by considering issues across the multiple domains of housing, economy, society and environment. The approach aims to build resilience into the future growth of London by identifying potential solutions to tackle the risks London faces.

Future Proofing London is a process that can, and should be embedded into how we plan and respond to challenges in the city now and in the future.

Our approach is multi-dimensional and provides a route from the diagnosis of issues through to solutions. The approach includes a diagnosis of risks and how these could unfold depending on the long term growth trajectory London takes, an assessment of London's capacity to act on these risks, and identification of potential solutions help to Future Proof London. This approach allows us to understand and analyse our working hypothesis: **London's competitive advantage as a world city is at risk from a lack of housing, a changing economy, social inequity and environmental quality.**

1. Mayor of London (March 2015), The London Plan: The Spatial Development Strategy for London Consolidated with changes since 2011.

Who should read this report?

The report is intended for organisations and individuals that can play a role in delivering London's future growth:

- regional and local level decision makers
- companies and public agencies responsible for delivering London's infrastructure and services
- companies working or looking to invest in London
- international and national investors
- developers
- urban planners, economists and social scientists and those working in these fields
- academic institutions and think tanks.

Report structure

This report is structured into six sections:

- London's competitive advantage
- The scale and pace of change
- The risks to London's competitiveness
- London's capacity to act
- Potential solutions
- Conclusions: what does Future Proofing mean for me?

02

LONDON'S COMPETITIVE ADVANTAGE

London's competitive advantage

When we talk about competitive advantage we mean the circumstances that put London in a favourable position in the global economy over competitive cities from around the world. The dashboard (see over page) shows how London compares to other top cities.

In comparison to other world cities London is well connected, has a diverse population, strong educational institutions and world-class cultural offer and many green spaces and parks. London is second in terms of ranking as a financial centre and has a higher proportion of jobs per person than both New York and Paris. Despite these strengths London's GDP is lower than other World Cities.

A number of indexes are used to rate global cities. While categories and indicators vary, competitiveness is measured by the amount of business, investment and people a city attracts. In these indexes London consistently ranks at the top[2] or in second place.[3 4]

The recent report by London First[5] provides a useful insight into London's competitive edge over other global cities in these key areas:

- **Attracting talent** – London has a higher proportion of the population who are graduates and has more international students than any other city in the world.
- **Attracting business** - London has more employees in both financial and professional services than any other city, and attracts more foreign subsidiaries than any other city.
- **Attracting investment** - the amount of foreign direct investment projects is nearly twice as many as elsewhere.
- **Attracting visitors** - currently the number one destination by international overnight visitors and overnight visitor spend for 2014.

Like other global cities, London's competitive advantage is due to a range of factors. Some are based on the city's inherent characteristics, while others have been acquired to maximise access to the global markets it benefits from. (see Table 2.1)

Table 2.1 London's competitive advantage

Type of Factor	Factors	Measure
Inherent	Location and time zone	The city is located close to its key markets and trade partners.
	Language	The language is widely used particularly in the markets it operates in.
Acquired	Leadership	City leaders take a global view.
	Stability	National and local politics, tax and regulations are conducive to business and trade. Strong presence of law and order.
	Attractive to talented people	Diverse job opportunities available, good educational infrastructure, labour market practices are flexible, quality of life is good.
	Availability of capital	Leading global financial centre which provides opportunities to access capital
	Adaptability and diversity in economy	The city has clusters in globally significant industries but has the ability to change over time to suit changes in the global economy.
	Ability to attract investment	The city has the ability to attract both foreign direct investment and domestic investment enabling further growth.
	World class infrastructure	The city has sufficient homes and offices, good transport, ICT and other infrastructure and a good quality environment.
	Global brand / awareness / reputation	The city has global appeal and a good reputation in the markets it operates in.
	Cultural offering	The city has a rich and appealing cultural offering which could include elements such as cultural institutions, diverse population and high quality public realm etc.
	Links to other cities	The international connections (particularily by air) to a wide network of cities around the world.

2. PWC (2014), Cities of Opportunity
3. The Economist Intelligence Unit (2014), Global Competitiveness Index
4. Long Finance (2014), The Global Financial Centres Index 16
5. London First (2015), London 2036: an agenda for jobs and growth, (pages 28, 29 and 39)

NEW YORK

Population metro area (2010)	16.5m
Population growth (2015-20)	0.21m
% foreign born population (2010)	35.6%

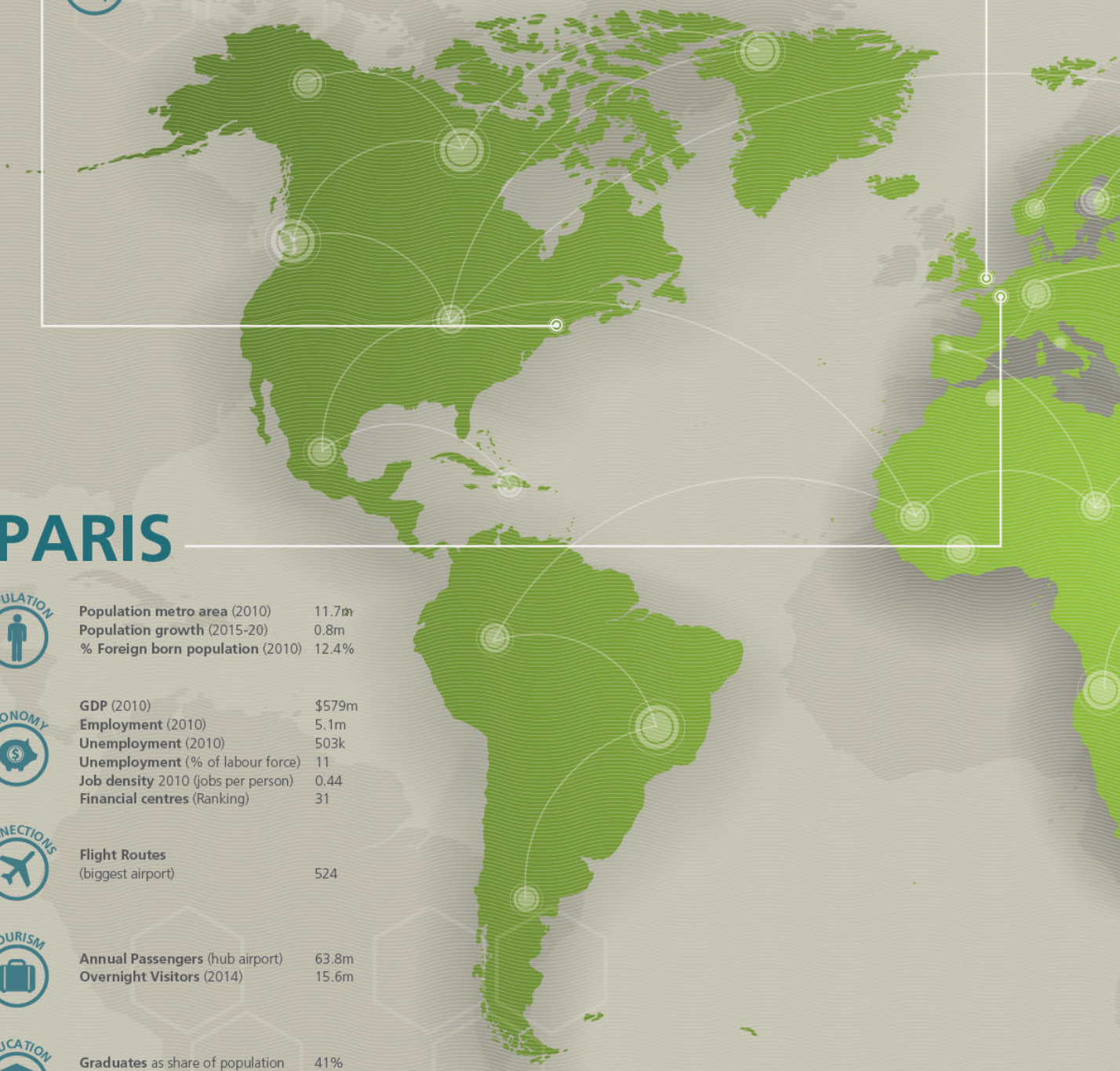
GDP (2010)	$952m
Employment (2010)	7.6m
Unemployment (2010)	724k
Unemployment (% of labour force)	11%
Job density 2010 (jobs per person)	0.46
Financial centres (Ranking)	1

Flight Routes (biggest airport)	456

Annual passengers (hub airport)	53.6m
Overnight Visitors (2014)	11.8m

Graduates as share of population	32%
Universities in World Top 50	2

No. World Heritage Sites	1
% of public green space	14%
No. of museums and galleries	852



PARIS

Population metro area (2010)	11.7m
Population growth (2015-20)	0.8m
% Foreign born population (2010)	12.4%

GDP (2010)	$579m
Employment (2010)	5.1m
Unemployment (2010)	503k
Unemployment (% of labour force)	11
Job density 2010 (jobs per person)	0.44
Financial centres (Ranking)	31

Flight Routes (biggest airport)	524

Annual Passengers (hub airport)	63.8m
Overnight Visitors (2014)	15.6m

Graduates as share of population	41%
Universities in World Top 50	0

No. World Heritage Sites	4
% of public green space	9.4%
No. of museums and galleries	1183

Source:
- OECD, UN World Urbanisation Prospects (June 2014). Urban agglomerations
- World Cities Culture Report (2013) Mayor of London
- Atkins based on OECD,Global Financial Centres Index (2014)
- Openflights.org, Airports Council International (April 2014)
- Mastercard Global Destination Cities Index (2014)
- London 2036: An Agenda for Jobs and Growth, London First (2015)
- The Time Higher Education World Rankings 2014/15
- World Cities Culture Report (2013) Mayor of London

LONDON

Population metro area (2010)	11.8m
Population growth (2015-20)	1.0m
% foreign born population (2010)	30.8%

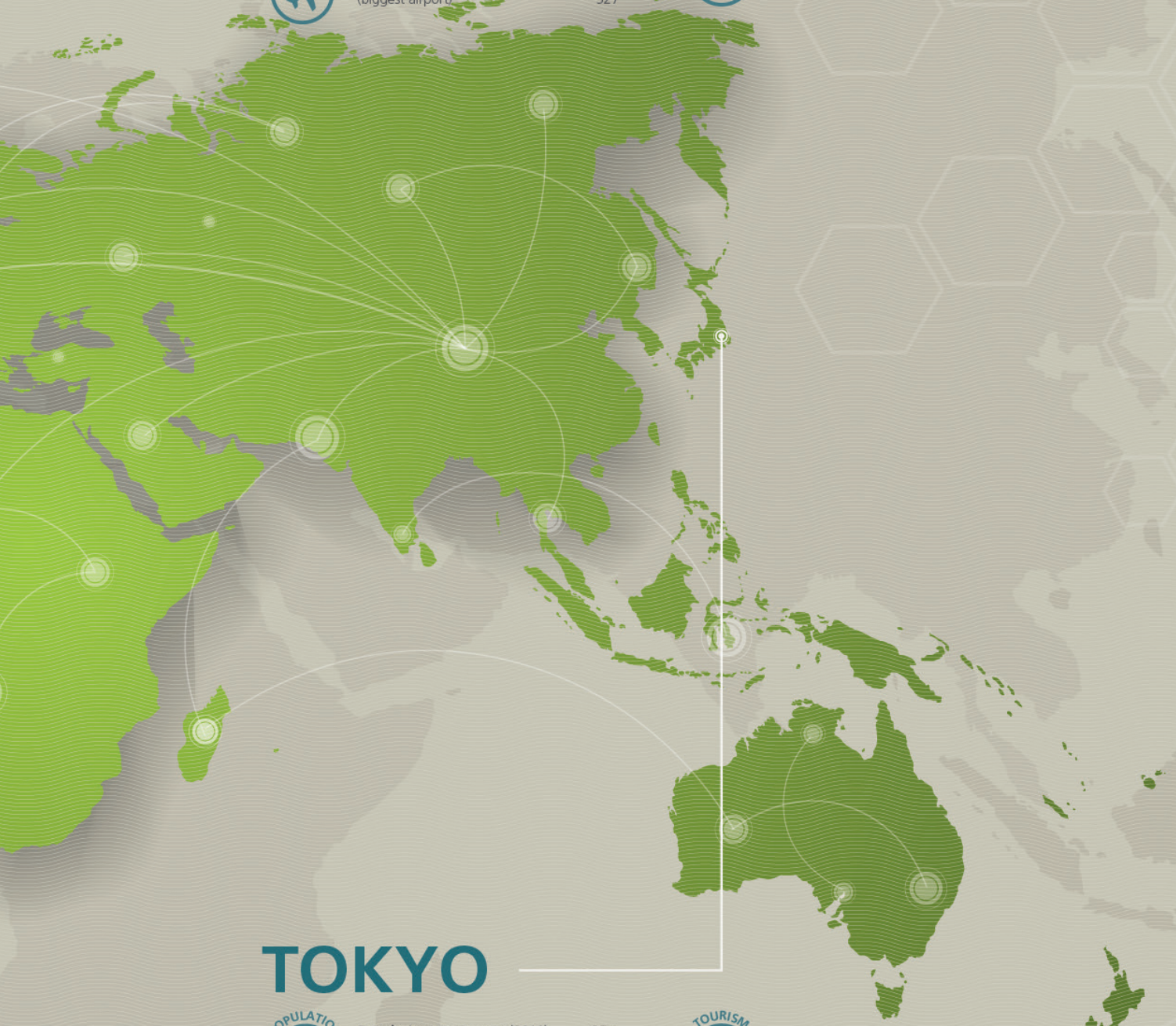
GDP (2010)	$549m
Employment (2010)	5.5m
Unemployment (2010)	491k
Unemployment %	12
Job density 2010 (jobs per person)	0.47
Financial centres (Ranking)	2

Flight Routes (biggest airport)	527

Annual passengers (hub airport)	73.4m
Overnight Visitors (2014)	18.7m

Graduates as share of population	53%
Universities in World Top 50	3

No. World Heritage Sites	4
% of public green space	38.40%
No. of museums and galleries	1030



TOKYO

Population metro area (2010)	35m
Population growth (2015-20)	0.17
% Foreign born population (2010)	2.4%

GDP (2010)	$1.3bn
Employment (2010)	17.6m
Unemployment (2010)	951k
Unemployment (% of labour force)	19%
Job density 2010 (jobs per person)	0.50
Financial centres (Ranking)	6

Flight Routes (biggest airport)	157

Annual Passengers (hub airport)	72.8m
Overnight Visitors (2014)	5.4.m

Graduates as share of population	20%
Universities in World Top 50	1

No. World Heritage Sites	1
% of public green space	3.4%
No. of museums and galleries	735

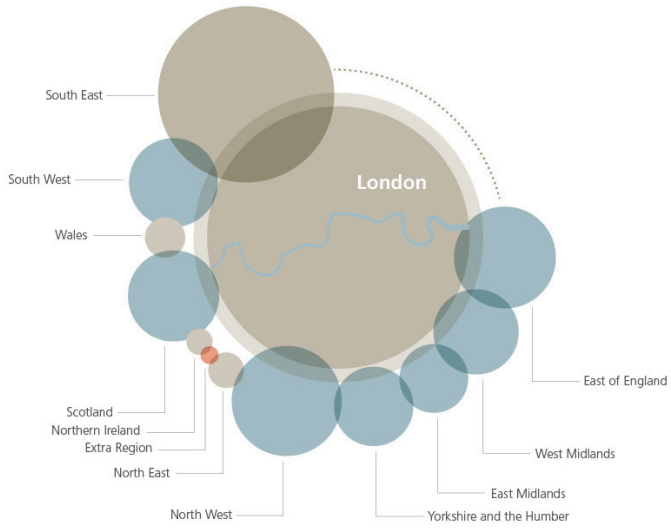
Why is London's competitive advantage important?

Successful global cities can expect to export more goods and services, attract more foreign investment, attract international visitors and students, boost human capital by attracting migrants of all skill levels, and have an active role in international networks that foster innovation and research.[6] These elements are all crucial to the success of the London economy. If London becomes less competitive compared to the growing list of cities around the world competing in the global markets, then London's share of exports, investment and talent will be eroded.

London's success on the global stage is also crucial to the UK's economic success. Gross Value Added (GVA) is a good indicator of the significance of the city to the UK's economic output, London has a 22% share of UK's total GVA[7] a significantly larger share of GVA compared to other regions in the UK (see Figure 2.1). London has seen sustained growth in GVA over the past 20 years with an annual average growth rate of 3.4% outstripping the rate of growth in the UK (2.6%).

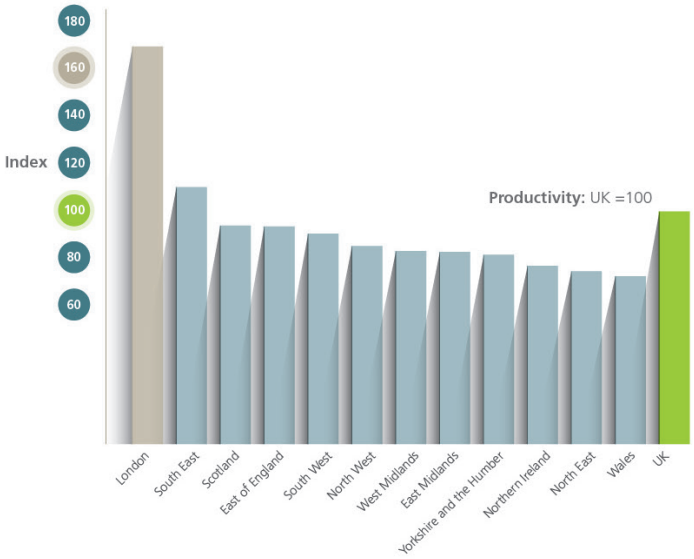
London also has a lead in productivity (GVA per head) compared to other regions in UK (see Figure 2.2). London and South East are the only regions with per head indices above the UK value. London is the most competitive region in the UK in economic terms.

Figure 2.1 Regional share of UK GVA



Source:ONS

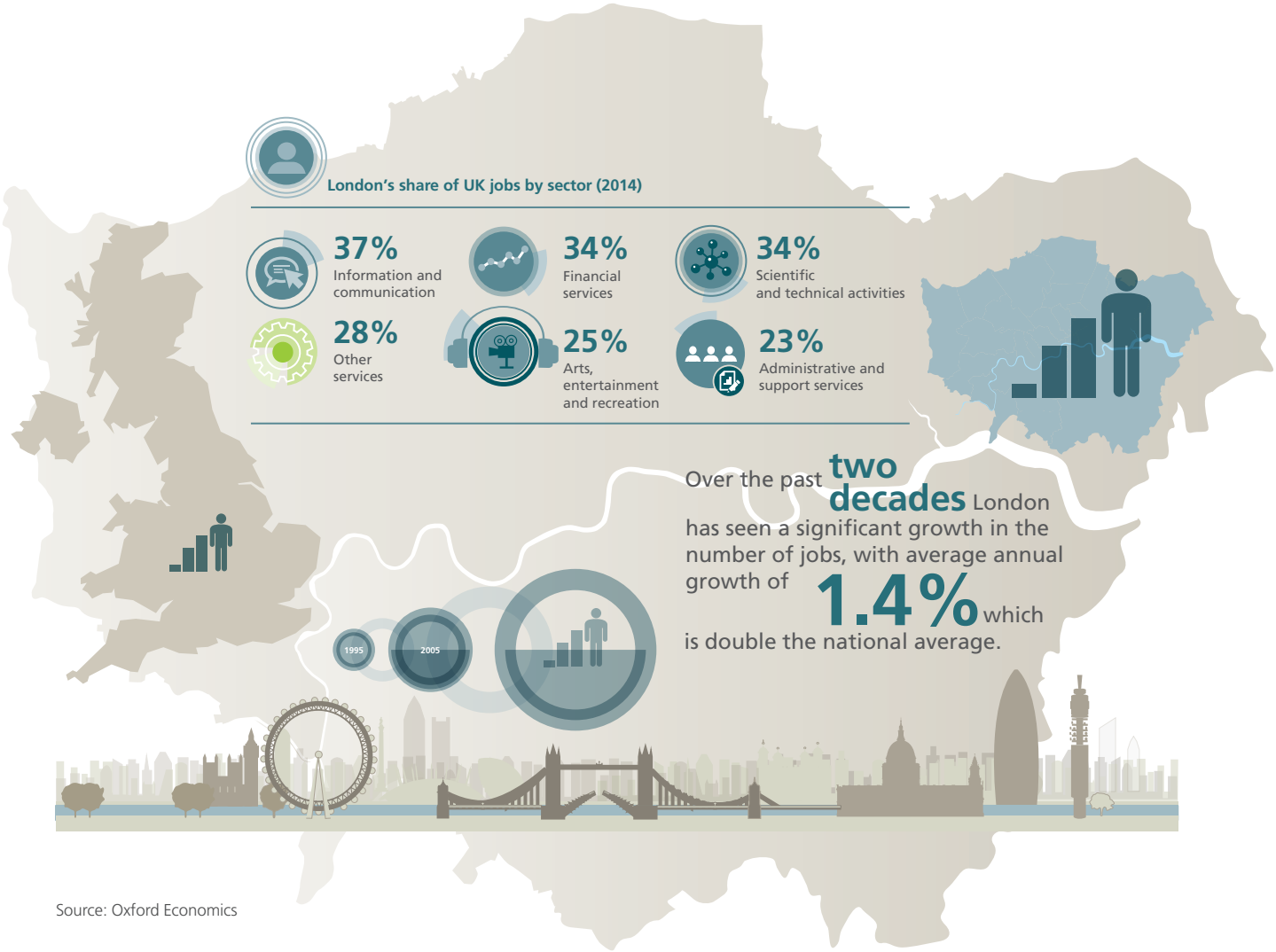
Figure 2.2 GVA per head index (productivity) 2013



Source:ONS

6. Brookings (2010), The 10 Traits of Globally Fluent Metro Areas

7. ONS (Dec 2014)



Source: Oxford Economics

Figure 2.3 London share of UK jobs by sector

Jobs growth in London has continued to outstrip the level of growth in the UK in last five years. The number of jobs in London has grown by 3% per year, while the UK has only grown by 1.1%. London now accounts for nearly 17% of the UK's employment, up from 15% in 2007.[8]

London is also important to the UK because of the type of jobs it accommodates. It is the leading centre for high value, export oriented service sector employment (see graphic).

The top three sectors projected to have the fastest rates of GVA growth in London (2015 – 2030) are all in the service sector, with annual growth rates for output of 4.5% (professional, scientific and technical), 4.3% (information and communication) and 3.9% (administrative and support). These sectors are all projected to grow at a slightly faster rate in London than in the UK as a whole.[9]

Given the importance of London to the UK economy, any impact on London's economy is an issue not just for London's continued growth but also for the success of the UK.

8. Oxford Economics (Feb 2015), London 2030 Study, Paper 1: Baseline forecast,

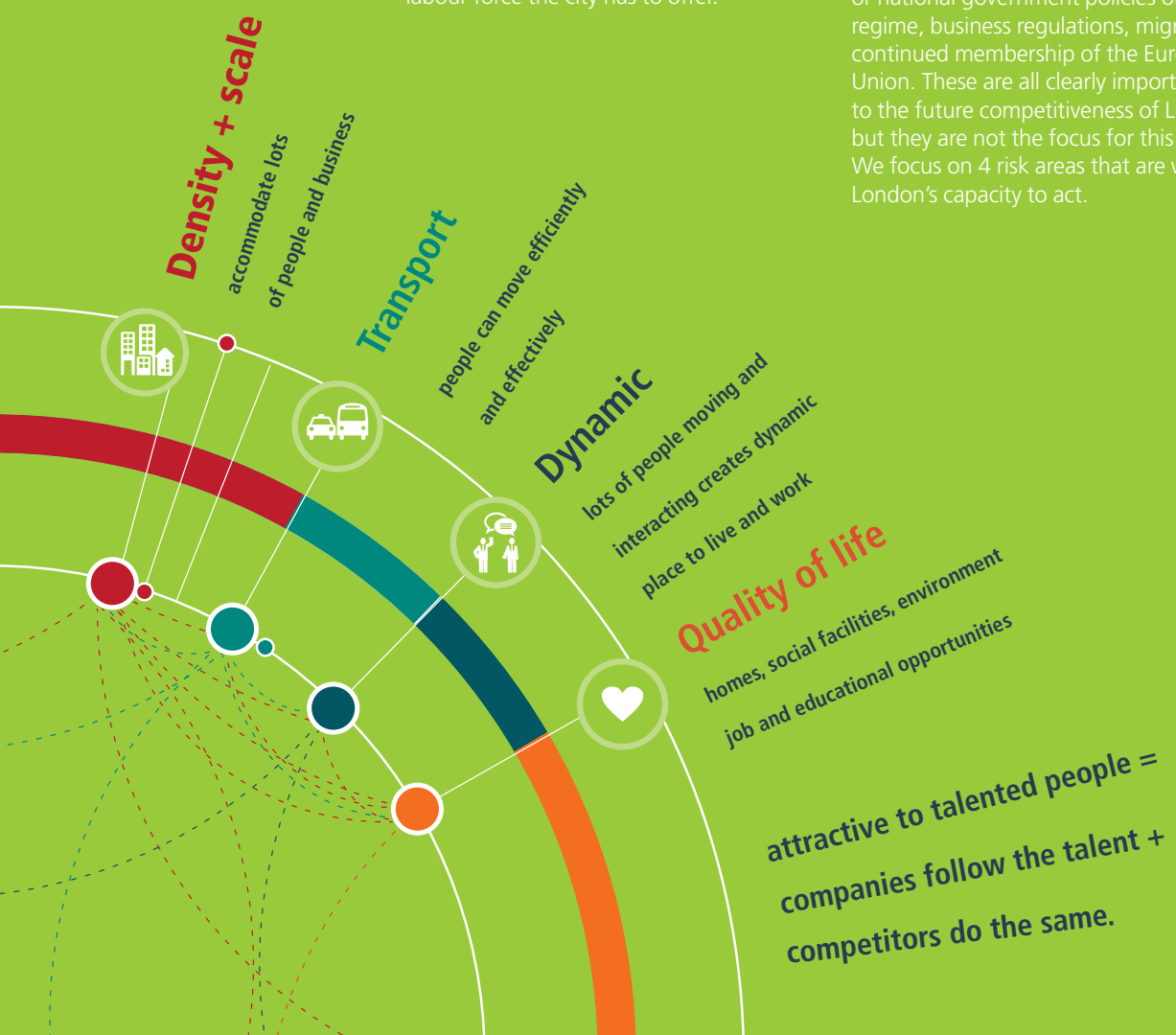
9. Oxford Economics (Feb 2015), London 2030 Study, Paper 1: Baseline forecast,

How could London's competitive advantage be threatened in future?

A key factor in a city's competitiveness is attracting skilled people. As the global economy moves to knowledge-based sectors, the need to attract skilled people will become increasingly important to and competition for skilled people will intensify. To compete, London will need to remain an attractive place to work and live for a pool of internationally mobile talent, and to retain its best people. People are attracted to London because of job opportunities and the quality and diversity of life the city offers. In turn this attracts more businesses seeking the talented labour force the city has to offer.

If London is to maintain that attraction and keep ahead of the competition, it will need to deal with the risks that could threaten that position.

London's global competitive advantage could be affected by risks that will impact on those characteristics that have made London the success that it is. There are many risks to London's competitiveness that are beyond London's capacity to act, for example, the global shift in economic power to Asia, increasing competition from other cities that are closer to emerging markets, or national government policies on the tax regime, business regulations, migration and continued membership of the European Union. These are all clearly important risks to the future competitiveness of London but they are not the focus for this report. We focus on 4 risk areas that are within London's capacity to act.



The four key risks to London's competitiveness

Our work focuses on four key risks that could be managed by addressing London's approach to strategic planning and infrastructure planning.

London does not meet its predicted housing needs.
Failure to build enough homes and enough affordable homes will lead to labour supply shortages in certain sectors of the economy. This will impact on the competitiveness of London as businesses want to locate where there is a ready supply of skilled labour. Where labour is in short supply, labour costs increase and businesses are unable to grow. Connected to this will be a growing inability to attract workers to perform crucial roles in the economy (health care professionals, teachers, policemen, childcare workers etc.). The lack of housing delivery will impact on London's ability to attract skilled and talented people to the capital. Furthermore, the lack of sufficient land for new housing means that residential use is competing with commercial use. It is hard for businesses to find affordable accommodation when offices are being rezoned to residential use.

London's economy becomes unbalanced.
As the structure of the economy changes towards increasingly high value sectors, with the associated loss of industrial land to commercial uses, there is a danger that London is losing its ability to accommodate businesses that not only provide jobs for the lower skilled, but also help the economy to function properly. It is also important to ensure that the economy is not overly reliant on footloose multi-national companies but also meets the need for space for local small and medium sized enterprises (SMEs) and companies. This will help to ensure that the economy remains diverse and is adaptable to changing global economic conditions.

London's society becomes more unequal.
Left unchecked inequality is likely to lead to social unrest. This could affect the stability of the London which will damage the appeal for investors, businesses and individuals who are considering London against other global cities. Another consequence of growing inequality may be a renewed push for more restrictions on movement of people into the UK at all levels of the skill spectrum. This would damage London's economic growth potential and ability to adapt to changing economic conditions.

London's environment becomes more degraded.
Failure to deal with the environmental risks (climate change, air quality, water shortages) that London faces will impact on quality of life (through increased risk to life and health) and will impact on liveability. Degradation of London's environmental quality could also place additional costs on business if the capital becomes a less attractive proposition for investment and could impact on London's ability to attract investment, talent and business.

These risks are explored in more detail in the next section. London will need to future proof against these risks in order to retain its competitive advantage.

Chapter Summary

- London is a successful global city that consistently ranks in the top two of global city indexes for competitiveness.
- Successful cities export more goods and services, attract more foreign investment, attract more international visitors and students, attract migrants of all skill levels and have an active role in innovation and research.
- London's success is crucial to the success of the UK given the city share of UK GVA, jobs growth and high value employment.
- London's competitive advantage rests on a range of factors which include its ability to attract talented people; its adaptability and diversity to the changing global economy; and the ability to attract investment.
- The risks to competitive advantage include not meeting its housing needs; the economy becoming unbalanced; society becoming more unequal; and the environment degrading.
- London's approach to planning and infrastructure needs to be addressed in order manage these risks and maintain London's competitive advantage.

03

SCALE AND PACE OF CHANGE

Population

Population is set to reach 11.1 million by 2036, and if London continues to grow at this pace the population will be more than 12 million by 2050.

Principal driver for growth is natural change (excess of births over deaths of resident population).

Net migration will see a sharp slowdown– although in the working age group population growth is mainly driven by net inward migration with 1.1 million net working age migrants into London by 2030.

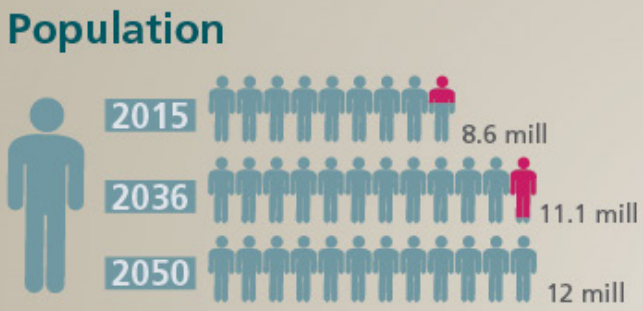
Outer London will accommodate most of the population growth.

Employment

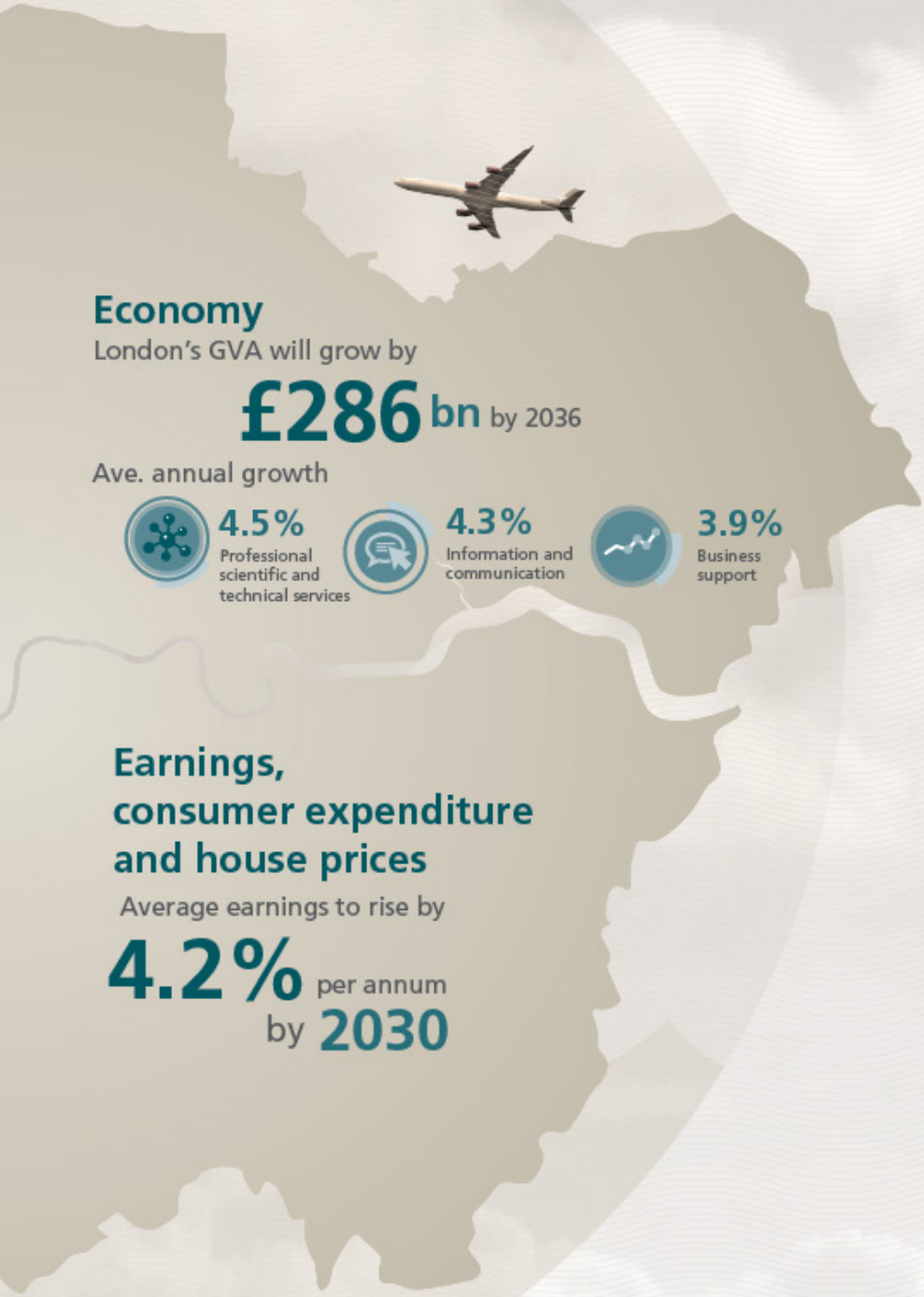
Economic growth in London will continue but a slower pace than in the past 15 years, with 1,046,000 new jobs by 2036.

A key driver for job growth will be professional, technical and scientific services which will account for 28% of the total job growth between 2015 and 2036.

The majority of jobs growth (62%) will be in inner London, but with strong growth in South West London.



Scale and Pace of Change



Economy

London's GVA will grow by £286bn (83%) by 2036. GVA growth (annual average) will be fastest in service sectors including professional, technical and scientific services (4.5%), information and communication (4.3%) and business support (3.9%).

Labour market

The working age population is projected to grow at a faster rate than the new jobs created in the period to 2036, but due to a projected decline in participation rates (those either in work or looking for work) and a slower rate of net in-commuting* to London this is not expected to lead to a rise in unemployment.

Earnings, consumer expenditure and house prices

Average earnings to rise by 4.2% per annum to 2030 only slightly outstripping the UK as a whole (4%).

Consumer expenditure to grow considerably faster in London than in the UK (2.8% annually compared to 2.3% nationally). This is supported by tourist spending and house prices as well as growth in population and employment.

By 2036 average house prices set to reach £1.4m, even this is taking a cautious view that house prices track growth in average incomes. But increasing divergence between those on high and low incomes will mean rising affordability problems for those on low incomes.

* In-commuting will still be an important part of the London economy, Oxford Economics forecast that net in-commuting will continue to increase but at a slower rate than previously.

London is facing rapid growth

London's population is growing at its fastest rate for 80 years. The economy is also growing rapidly, and will be expected to accommodate more workers. The level of growth is beyond what has been planned for and will place considerable pressure on London's housing and infrastructure.

The London Plan[10] (Central Scenario) forecasts population growth of 1.4 million by 2036 reaching 10.1 million[11]. However the Oxford Economics projection identifies growth of 2.4 million reaching 11.1 million by 2036.

The London Plan indicates population growth between 2015 and 2030 will mean there is a need for 700,000 new homes (49,000 per year). However the Oxford Economics identifies forecasts population growth of 1.7 million people over this period, meaning that the London Plan may be underestimating housing need. If so, housing supply could act as a brake on the capital's economic growth. There are some implications: either the housing market must provide enough homes or household sizes would need to increase to accommodate the predicted level of population growth.

The London Plan predicts jobs growth of 732,000 by 2036. This is 314,000 fewer than Oxford Economics forecasts and also begins from a lower starting point as it fails to take account of 625,000 jobs created 2012-14.

If the Oxford Economics baseline projections are correct then the projections used in the London Plan are underestimating future employment and future population. The underlying assumptions in the London Plan are likely to be revised upwards when the London Plan is reviewed over 2015/2016.

Extended London Plan projections[11a] are used in the London Infrastructure Plan 2050. These project a population of 11.27 million at 2050, however Oxford Economics forecasts that this level will reach 2038. Jobs are forecast to reach 6.3 million by 2050, a level that the Oxford Economics forecasts will be surpassed by 2026.

If the projections are underestimating the level of growth, this could make it harder for London to bid for the infrastructure funding that is critical to support the actual level of growth.

It is also important to note these population and employment projections are what London 'could' achieve and that they are critical to London's future. There are real risks to achieving this potential (explored in the section on risks). In particular if London doesn't provide enough housing, the levels of population and jobs growth will not be achieved, and economic growth would be hindered as a result.

10 GLA (March 2015) The London Plan: the spatial Development Strategy for London, consolidated with alterations since 2011.

11 There are two reasons the FALP projections are lower than Oxford Economics projections. First the FALP projections have not been revised to incorporate the latest (2012) information on births and deaths and on recent migration, as incorporated in ONS sub-national population projections (SNPP) accounting for 0.6m. Second is that Oxford Economics projections take into account their estimates of future employment opportunities. As the London economy is forecast to grow faster than the UK economy migration is higher in the Oxford Economics projections than the SNPP.

11a GLA (Nov 2013) Population and Employment Projections to Support the London Infrastructure Plan 2050 (November 2013).

04

THE RISKS TO LONDON'S COMPETITIVENESS

SLOW

Risks to London's competitive advantage

Our analysis has identified that London faces a range of significant risks as it continues to grow. There are compelling reasons to deal with each of these risks, but we believe that when combined these risk factors present a wider risk to London's global competitive advantage and will affect London's economic growth. This is an issue for London's continued growth but also for the UK as a whole, as London is crucial to the growth of the UK economy.

This section considers the risk factors that have been diagnosed in chapter 1 where:

- London does not meet its predicted housing needs
- London's economy becomes unbalanced and fails to provide opportunities for all Londoners
- London's society becomes more unequal
- London's environment becomes more degraded as a result of growth

Risk: London does not meet its housing needs

In the past 15 years, London's population has grown by 1.5 million to 8.7 million (rising by an average 1.2% per year). Oxford Economics forecasts London's population will continue to grow at the same rate, meaning that London's population will grow by 1.7 million by 2030, and will reach 11.1 million by 2036.

This is a growth of 2.4 million from its 2015 level. In contrast, the London Plan 'central scenario' projects a total population rise of 1.4 million with total population reaching 10.1 million by 2036.

If Oxford Economics population projections prove correct and the Mayor's assumptions about declining household size are also correct, the London Plan will have underestimated the number of houses London needs.

London is facing a considerable housing shortage. Current housing delivery is not keeping up with the current levels of demand. There is a risk that the housing shortage in London will impact on the capital's economic competitiveness. The housing shortage coupled with rising demand is causing property prices to rise to unprecedented levels. More and more Londoners are unable to afford to live in the capital and are being pushed further out and even beyond London's administrative boundary. The reduction in the capital's available workforce will impact on the ability of London's economy to maintain its competitive edge in the global economy.

Shortfall in housing delivery

Across London, the rate of housing development has not kept pace with population growth. Imbalances in London's housing supply and demand is leading to an increase in the number of overcrowded properties (see Map 4.1). The Mayor's housing strategy sets an annual target of 42,000 new homes in London.[12] Past trends suggest this ambitious target is unlikely to be met without radical change. The last time more than 42,000 units were built was during the 1930s.

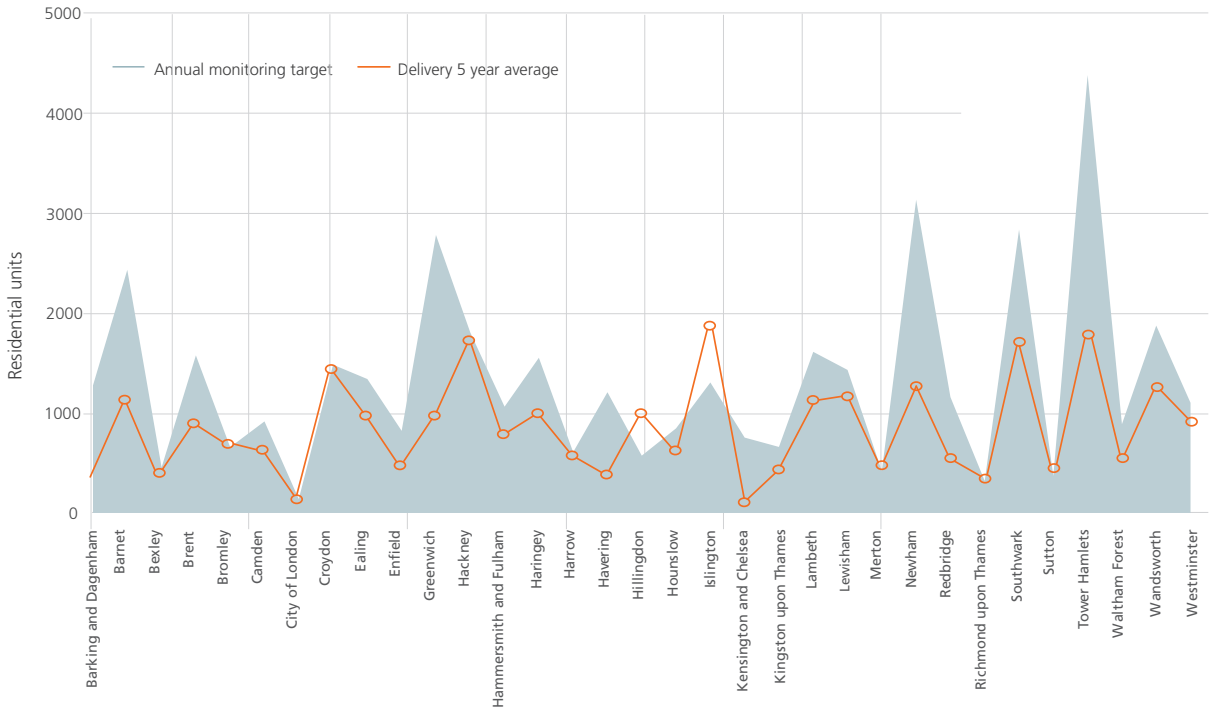
Based on average housing delivery over the past five years of 26,000, London is not currently meeting its housing requirements. Atkins estimates a shortfall of 1.5 million homes in the South East and East regions by 2050 if recent rates of delivery continue.

GLA housing target shortfall

Most London boroughs achieve levels of housing delivery that fall short of the GLA's housing delivery targets.[13] Figure 4.1 illustrates that London Boroughs of Hillingdon and Islington exceeded their target and only four boroughs, Bromley, Merton, Richmond upon Thames and Sutton were meeting their annual monitoring target when taking into account average delivery over a five year period. The majority of London's boroughs were significantly below the housing delivery target.

Boroughs that are delivering significantly below the annual monitoring target (by more than 1,000 housing units) include Barnet, Greenwich, Newham, Southwark and Tower Hamlets. The constrained housing supply across London's boroughs is impacting on the affordability of housing for the majority of the city's population.

Figure 4.1 Housing target v Housing delivery (2008/9 - 2012/13)



Source: London Plan Annual Monitoring Report (2014)

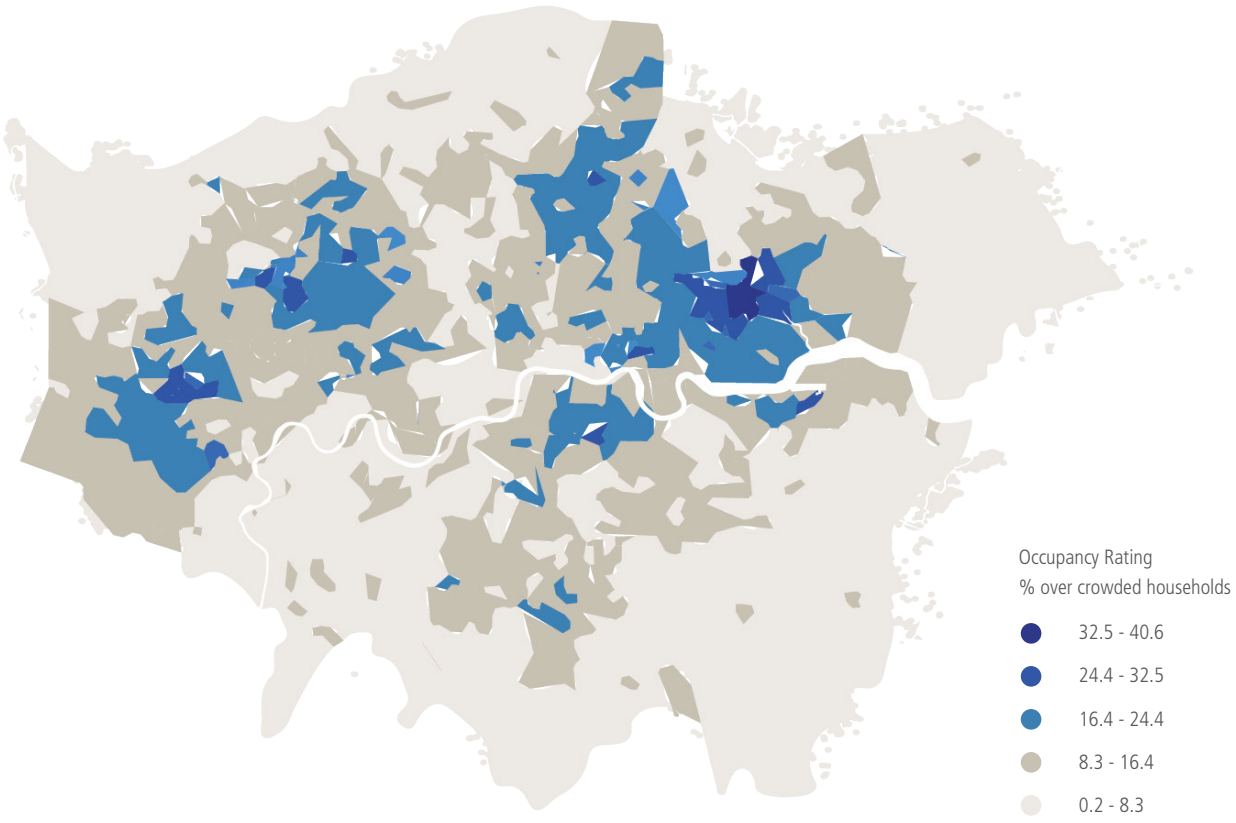
12. Homes for London (June 2014), The London Housing Strategy

13. Savills (2014) London Infrastructure Connecting Opportunities

Overcrowding

Low levels of housing supply coupled with rising house prices is also leading to a considerable overcrowding of London properties. Boroughs with numerous areas (where over a quarter of all households are overcrowded) include Newham, Brent, Haringey, Southwark, Ealing and Hounslow (Map 4.1).[14] Overcrowding can have a significant impact on the health and well-being of occupants, including children and older people.[15] For example, children are more likely to contract tuberculosis and meningitis and all types of occupants are likely to experience respiratory problems and/or worsening of existing medical conditions.[16]

Map 4.1 Occupancy rating % over crowded households



Source: London Datastore

14. CIS (Jan 2014) Trends in Overcrowding

15. London Assembly (March 2011) Crowded Houses

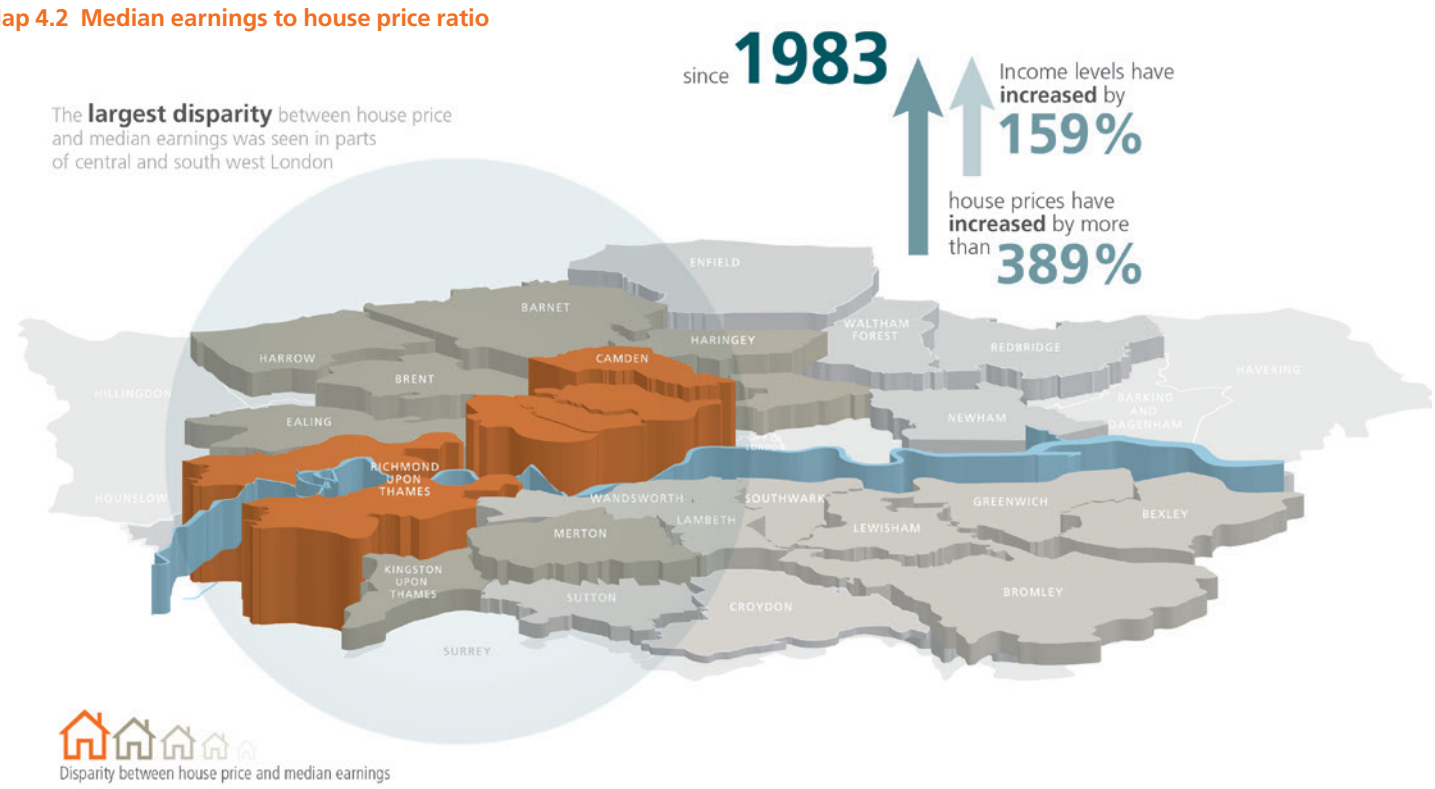
16. Shelter (2006) Chance of a Lifetime. The impact of bad housing on children's lives

Affordability

The London housing demand and supply mismatch is pushing up property prices beyond the means of most Londoners. Whilst income levels have increased by 159% since 1983 in London, housing prices in the capital have increased by 389%.[17] The largest disparity between house price and median earnings was in parts of central and south west London, in Kensington and Chelsea, Westminster, Hammersmith and Fulham, Camden and Richmond Upon Thames (Map 4.2). Average London house prices have now exceeded £500,000 and by 2036 average house prices are expected to reach £1.4m.

Inclusivity in London is under threat as people are increasingly unable to afford a place to live and therefore opt out of living in the capital. Research by Shelter shows that in 31 out of 32 London boroughs, less than 10% of available properties are affordable to a couple with children on average wages.[18] This has put significant pressure on Londoner's budgets and has begun to force people out of the city. One particularly graphic illustration of this is that reaching the end of a private rented tenancy has now become the biggest cause of people being classified as homeless in London.[19] People are coming to the end of their rent contract and find they are unable to renew it at the increased price, nor can they afford other rented property in the locality. The result is often that they are forced to move away from the area to somewhere with cheaper rents. This exclusionary effect of high housing costs is not limited to those on low incomes. Recent analysis based on NHS records also suggests that skilled families are leaving London in record numbers.[20] Crucially, the majority of these families seem to be moving to other UK cities, suggesting they are looking to escape London housing costs, rather than looking to move to more rural areas.

Map 4.2 Median earnings to house price ratio



Source: DCLG

17. London Councils (2012), The London Housing Challenge, a London Councils Discussion Paper

18. Shelter (2013) How much of the housing market is affordable?

19. Fitzpatrick, S., Pawson, H., Bramley, G., Wilcox, S., & Watts, B. (2013). The Homelessness Monitor: England 2013 (London: Crisis).

20. Morris, S. (2014) Brum on Over: the London Exodus to UK's Second City. Guardian, 22 December 2014

Map 4.3 illustrates migration movements into and out of London. There is a clear pattern of migration movement from London into the surrounding local authorities in the South and East. These regions have strong ties with London, as given their proximity; residents living there may commute back into London for work.

Workplace based average earnings in London are currently around 40% above the UK national average, at just under £700 a week,[21] making London an attractive place to work. Commuting distances are increasing, as people are pushed out of London as a result of house prices.

Multiple barriers to housing delivery

Unlocking the barriers to housing delivery in London is complex and dependent on both the private and public sector.

Developers are facing high construction costs, lower availability of materials and construction workers and are encountering delays during the planning application approval process.[22] In addition, poor infrastructure (especially transport infrastructure) is a major barrier for site development.[23]

Map 4.3 Net internal migration to London (2011)

21. Oxford Economics (Feb 2015) London 2030 Study Paper 1: Baseline Forecast
22. GLA (2014) Barriers to Housing Delivery - Update
23. Savills (2014) London Infrastructure Connecting Opportunities

Source: Census 2011

The risks and consequences of London's housing shortage

Displacement of London's population

As demand outstrips supply and house prices and rental values continue to rise, London's properties are becoming increasingly overcrowded and unaffordable. More and more Londoners are moving outside of the capital and commuting in from the South, East and other parts of the UK. This has an unbalancing effect on the diversity of London's labour force.

Health and wellbeing

Low levels of housing supply coupled with rising house prices is also leading to a considerable overcrowding of London properties. Overcrowding can have a significant impact on health and wellbeing.

Transport network pressure

Rising housing prices are pushing people out of inner London, where the greatest concentration of jobs are located. This shift in the resident location of London's workforce is increasing pressure on both public transport and the local road networks.

Risk: London's economy becomes unbalanced

London's economy is increasingly focused on the Central Activities Zone (CAZ). In recent years growth in employment in London is increasingly focused in the centre and inner areas of London, which contains a greater concentration of financial and business services. Areas with high concentrations of employment growth were mostly in the inner Boroughs of the City of London, Tower Hamlets, Islington, Westminster and Camden (Map 4.4).

Outer London has experienced relatively lower levels of growth than inner London. Yet outer London has the potential to contribute more to London's economic success, given that the number of people living in outer London is increasing as housing becomes more unaffordable in the centre of London.

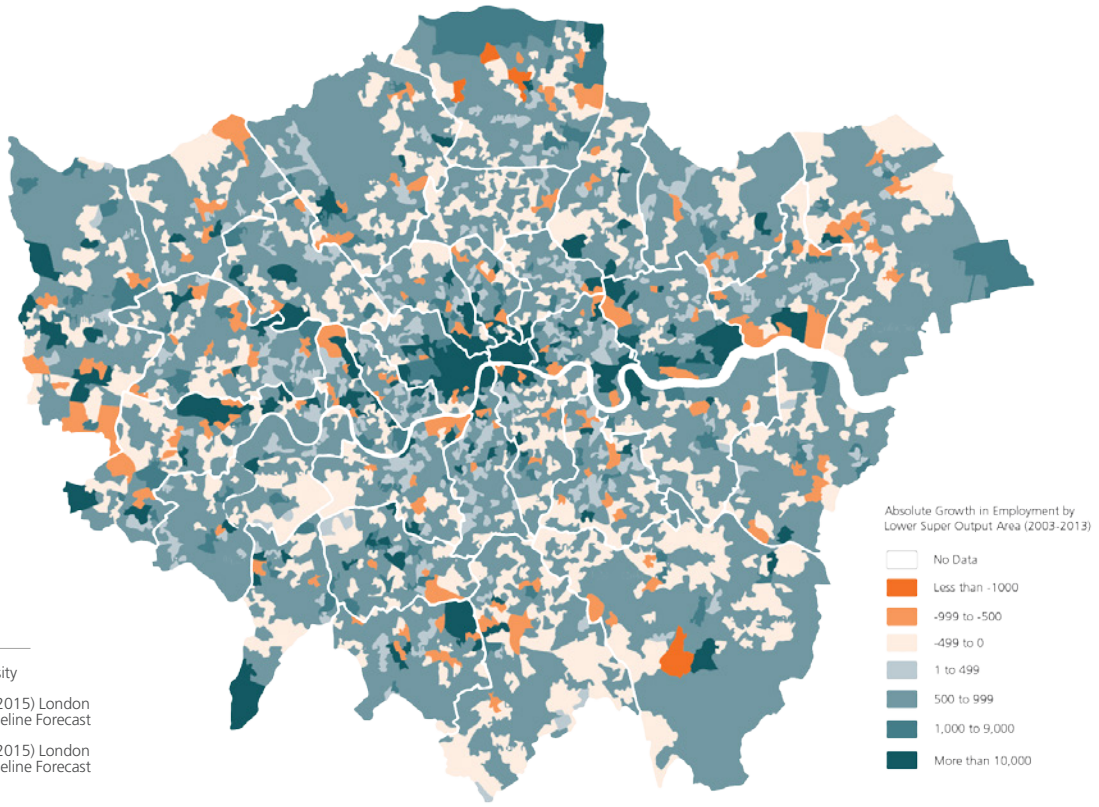
Spatial imbalance of employment growth

Employment opportunities are not equitably distributed across London. In 2012, average job density for Boroughs in inner London was high at 6.7, compared with the average in outer London which was 0.6.[24] Outer London residents are therefore reliant on commuting into inner London for employment opportunities which places additional pressure on London's transport network. Inner London has seen the majority of employment growth and it is assumed that this trend will continue as the Oxford Economics latest projections acknowledge.[25]

Oxford Economics predict by 2030, 57% of London's total jobs (3.7 million) will be located in inner London.[26]

However, most of central and west London are unaffordable to live for the majority, which is pushing people on lower incomes out to the suburbs (where the average price of a flat is still below £250,000). Access to affordable housing is critical to the functioning of London's economy (as explored in the housing risk). Ultimately, if housing affordability in London continues to decline, low-skilled workers will find it increasingly difficult to live in London and this will impact on London's labour supply and ultimately economic success.

Map 4.4 Percentage growth in employment in London between 2003 – 2013 (LSOA)



Source: ONS, BRES/ABI

24. NOMIS (2012) Job Density
25. Oxford Economics (Feb 2015) London 2030 Study Paper 1: Baseline Forecast
26. Oxford Economics (Feb 2015) London 2030 Study Paper 1: Baseline Forecast

Inner London employment growth is driven by a greater concentration of those high value sectors (including professional, real estate, scientific & technical activities) which value agglomeration. Oxford Economics forecast that by 2030 the majority of inner London's jobs will be located in the professional and related sectors (36%).[27] The clustering of economic activities in the centre has been facilitated by inner London's excellent transport links, dedicated business districts/clusters (e.g. Canary Wharf, Tech City), high employment density and global reputation.

Recent Oxford Economics baseline forecast shows that of the 808,000 net additional jobs forecast in London by 2030 over 498,000 are expected to be located in inner boroughs. Inner London created 72% of all net new jobs in the period 2000 to 2015 that jobs growth in Inner London will slow to 61% of all net new jobs in the period to 2030. This forecasts stronger job growth in outer London is primarily focused on growth in outer south and outer west London while boroughs in the outer north and east lag behind in jobs growth.[28]

27. Oxford Economics (Feb 2015) London 2030 Study Paper 1: Baseline Forecast

28. Oxford Economics (Feb 2015) London 2030 Study Paper 1: Baseline Forecast

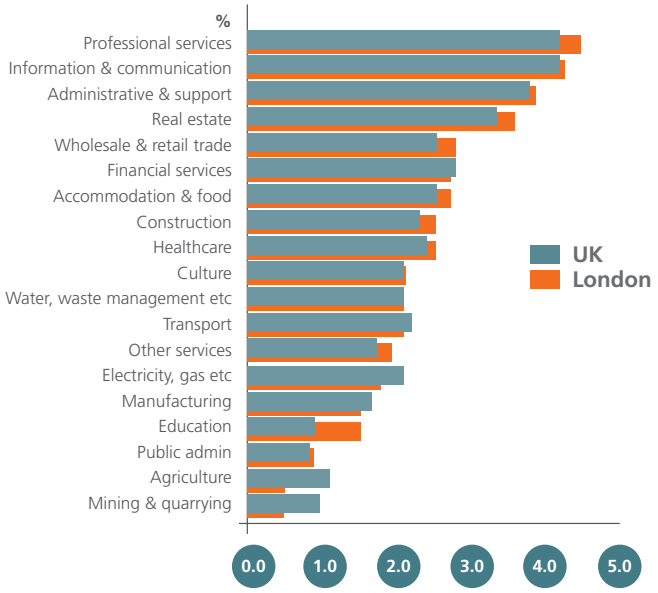
High value sector growth

According to recent Oxford Economics projections, the three fastest growing sectors in London are professional, scientific and technical services (4.5% average annual growth), information and communication (4.3% average annual growth) and administrative and support (3.9% average annual growth). This is slightly faster than the equivalent UK growth rates (Chart 4.1).[29] Boroughs with a high level of high value employment growth include the inner boroughs of City of London, Tower Hamlets, Islington and Westminster.

The economic shift towards high value sectors is marginalising some people from the labour force. Almost half of all the graduate vacancies (45%) are located within London and are concentrated in the skilled sectors, including media, banking, law, charities and public affairs.[30] Getting a permanent job within these sectors often requires periods of low or unpaid work experience, which may be more difficult for some graduates to afford given the rising housing rents across London. It is estimated that by 2025 around £85 million GVA will be lost to the London economy due to the effects of housing prices dissuading young professionals from moving to London.[31]

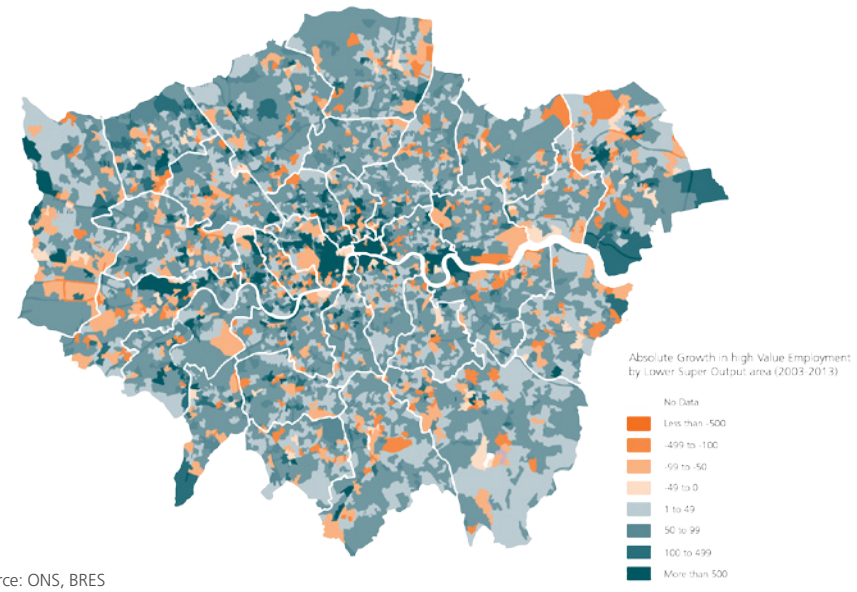
The continual increase in high value sector jobs in London is also reducing the number of employment opportunities for the lower skilled workforce. According to Oxford Economics, traditional industrial sectors are expected to decline by 2030 in line with national trends, which will impact on manufacturing (72% decline), primary and utilities (52% decline), wholesale (38% decline) and transportation and storage (24% decline) (Chart 4.1).[32] Over time, this trend could lead to an imbalance in London's economy with underrepresentation in lower value sectors that support the core functioning of the capital.

Chart 4.1 Expected GVA growth by sector in London & UK (%, 2015 - 2030)



Source: Oxford Economics, London 2030 Study: Baseline Forecast, 2015

Map 4.5 Change in high value employment (2003-2013)



Source: ONS, BRES

29. Oxford Economics (Feb 2015) London 2030 Study Paper 1: Baseline Forecast
30. Denholm, A. (2015) Graduate Jobs on the Up. Herald Scotland, Tuesday 27th January.
31. Ball, M. (2012) Core Renters in London's New Build Market and the Future of the London Economy. Get Living London.
32. Oxford Economics (Feb 2015) London 2030 Study Paper 1: Baseline Forecast

Declining industrial land supply

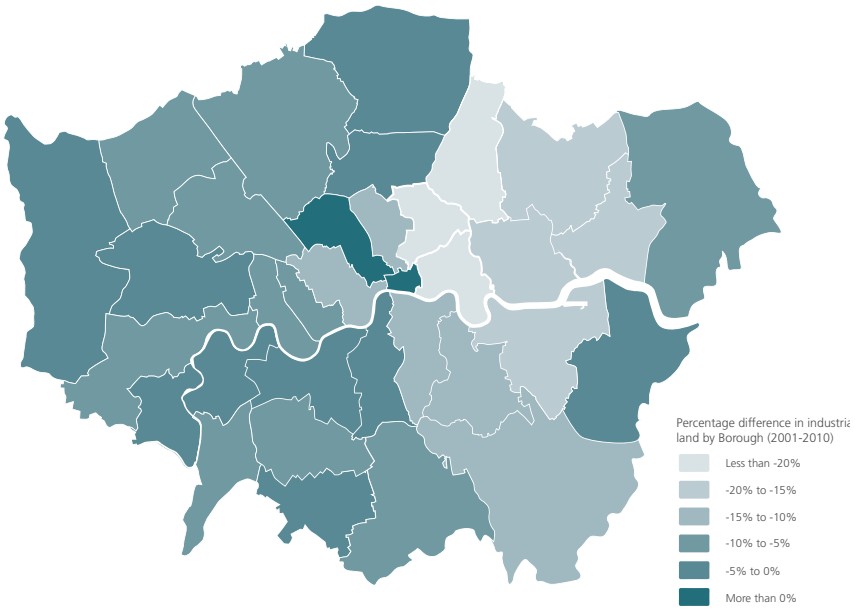
Between 2001 and 2010, industrial land decreased across London by 9%. East London including Tower Hamlets and Hackney, experienced a significant loss of industrial land (over 25% of industrial land stock) and Newham, Barking & Dagenham, Redbridge and Greenwich lost at least 15% of their industrial land area. The decline in industrial land is representative of London's changing economy and the competing pressures for land, as much of this land has been redeveloped for commercial and residential use (Map 4.6).

Vacant industrial land is limited across inner London; the largest concentration of industrial land vacancy is concentrated in outer east London (Map 4.7).

The significant pool of vacant industrial land in outer London does present an opportunity to provide land for housing development, but the redevelopment of industrial land in these areas will need to be managed carefully to ensure new opportunities for employment are provided alongside new homes.

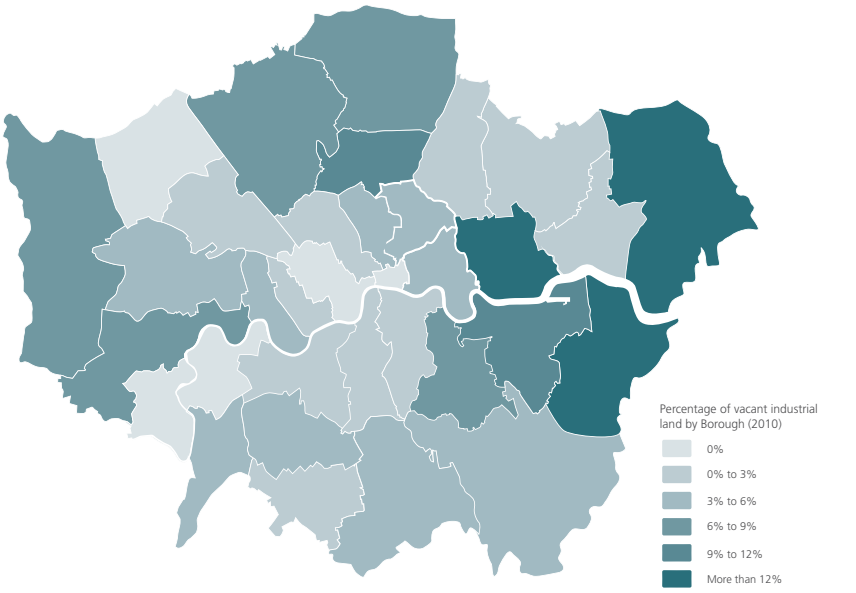
Although London is shifting towards a more service-based economy, industrial land for light industrial uses and warehousing for storage and distribution is still required to maintain a strong economy and a diverse range of employment opportunities.

Map 4.6 Change in industrial land (2001-2010)



Source: London Industrial Land Baseline, 2010

Map 4.7 Vacant industrial land



Source: London Industrial Land Baseline, 2010

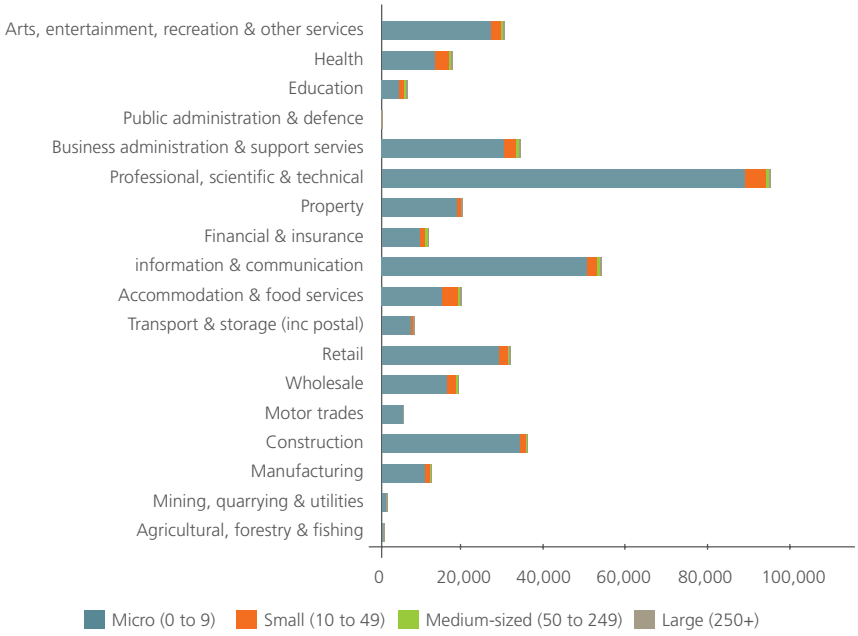
London's business structure

SMEs form a large part of London's economy, with 90% of all of London's businesses employing less than ten people (Chart 4.3). Micro businesses dominate London's high growth value sectors (including professional, real estate, scientific & technical activities). Small businesses are important for innovation in business and can drive product innovation as they grow. In addition, there tends to be greater equality in wages in SMEs than in larger businesses and multinationals.[33]

The shift from industrial land to other uses needs to be managed to ensure the impact on SMEs, which are often resource-constrained and require affordable and flexible business units, including hybrid units, for example combination of office and light industrial.

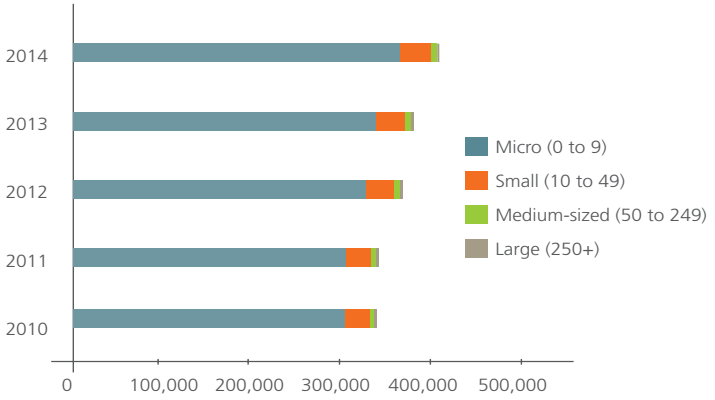
The decrease in industrial land and affordable workspace across London, along with recent changes in planning regulations (Permitted Development Rights) that allow offices to be converted to residential buildings may upset the balance between housing and employment growth.

Chart 4.2 Size of London's business by sector (2014)



Source: NOMIS, UK Business Counts, Enterprises, 2014

Chart 4.3 Size of London's business (2010 – 2014)



Source: NOMIS, UK Business Counts, Enterprises, 2010 - 2014

33. The Economist (May, 2015) The bigger, the less fair http://www.economist.com/news/finance-and-economics/21646266-growing-size-firms-may-help-explain-rising-inequality-bigger?fsrc=scn/tw/te/bl/ed/inequality

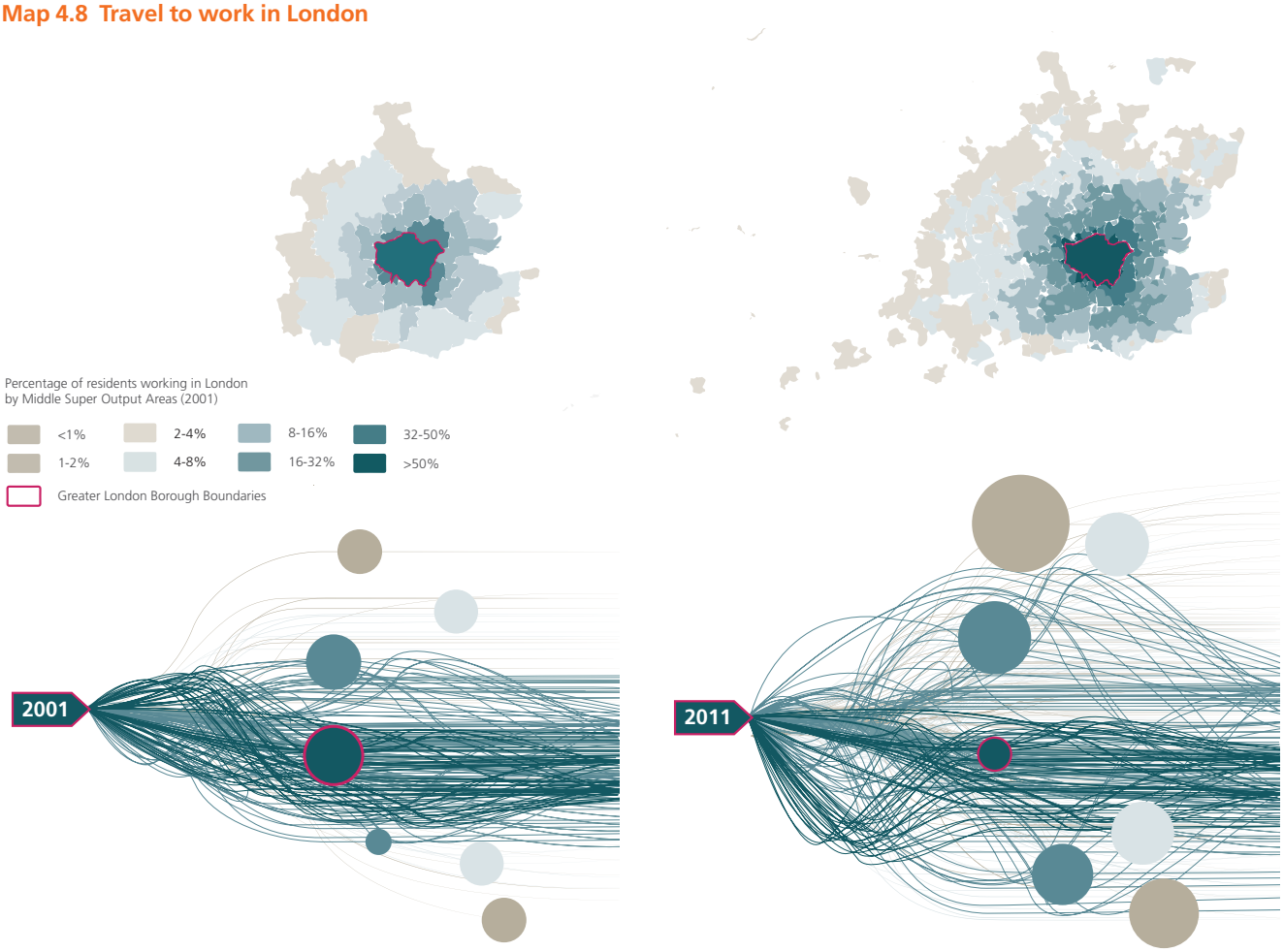
Commuting pressures

The majority of commuters come into London from the neighbouring regions of the South and East (Map 4.8). Between 2001 and 2011, London's commuter belt rapidly expanded along with commuting time. As commuting continues to grow, there will be strain on infrastructure, as people increasingly commute longer distances from the South and East and other parts of the UK to London.

Outer London continues to be poorer than inner London in relative terms, experiencing high levels of deprivation and fewer job opportunities. Travel to work patterns within London show that inner London has a 'magnetic pull' effect on the region. This can be attributed in part to the higher density of employment opportunities in inner London, particularly within the City of London (Map 4.9).

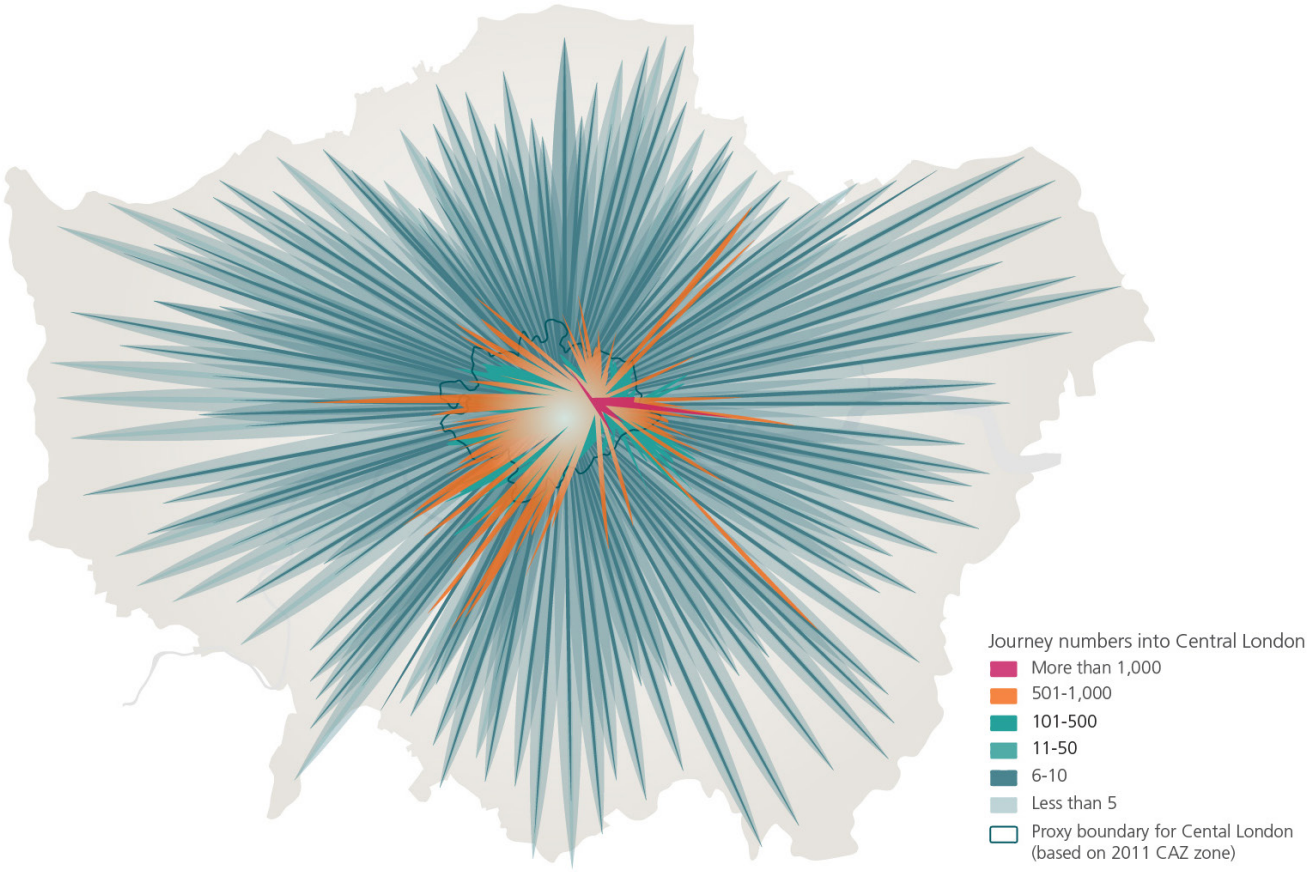
Accessibility is important for businesses being able to attract customers and to have readily available access to the labour force. London's transport network is therefore critical to maintaining London's global economic competitiveness and productivity. The shift in residential location of London's workforce to outer London and beyond is leading to longer commuting times and increasing pressure on the existing transport network.

Map 4.8 Travel to work in London



Source: Travel to Work Data, Census 2001 and 2011

Map 4.9 Daily travel to work movements to the Central Activities Zone (CAZ)



Source: Travel to Work Data, Census 2011

The risks and consequences of London's changing economy

Labour shortages

The increasing cost of living in London is pushing the lower earning workforce out of London. An undersupply of low skilled and low earning workers is already impacting on local businesses and the ability of the capital to deliver much needed housing and key infrastructure projects.

Declining economic diversity

The continual increase in high sector jobs in London could impact on employment opportunities for the lower skilled workforce over time leading to an imbalance in London's economy with underrepresentation in lower value sectors that support the core functioning of the capital. Labour shortages could impact on the delivery of housing and infrastructure projects across London.

Imbalance between housing and employment

The erosion of industrial land supply, along with the changes in planning regulations and the potential conversion of existing key strategic industrial sites across London would impact on a range of businesses from large multinational companies to SMEs. This has the potential to upset the balance between housing and employment provision in the city.

Pressure on London's transport infrastructure

London is experiencing a higher rate of job growth, particularly in the higher skilled and higher paid professions, in comparison to the rest of the UK. This has led to an increase in the number of people willing to commute to London for work from the East and South East regions and beyond. With more people travelling into London (over a longer distance) this is creating additional strain on the functioning capacity of London's transport infrastructure.

richest

one%

of employees earns

fifteen times

more than the bottom

one%

a rate which is

fifty%

higher than the rest of the UK [34]

Risk: London's society becomes more unequal

It is well recognised that the gap between rich and poor is worsening, and the polarisation of wealth has now reached an all time high within London. Another change is the spatial distribution of inequality, where the pattern of poverty is shifting away from the inner city and towards outer London, creating segregation and tensions between communities. So as London becomes more polarised, it risks becoming unattractive to both employers and employees which poses a risk to the city's global competitiveness.

34. The Equality Trust (2013) A Divided Britain? Inequality Within and between the Regions

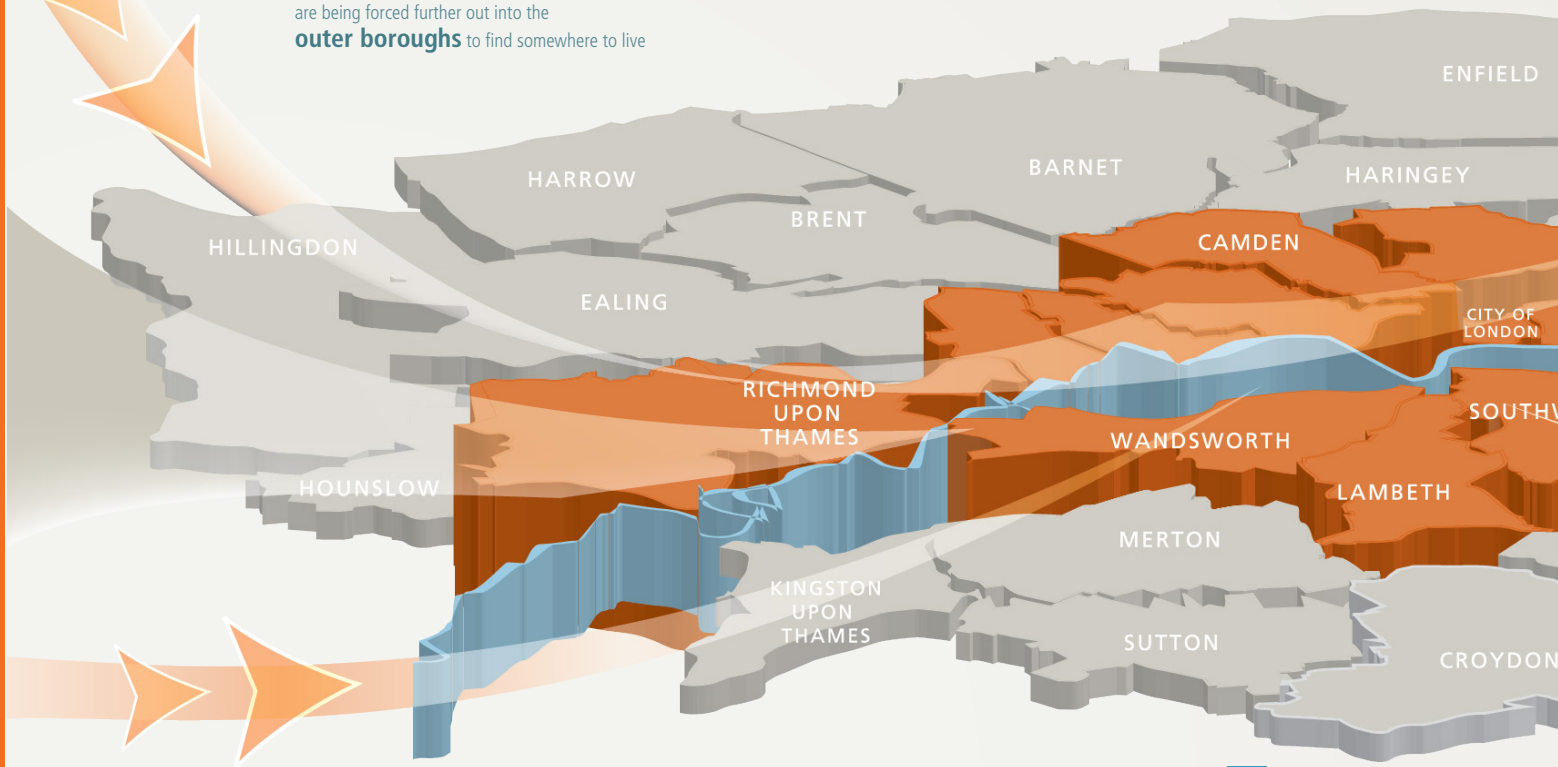
35. London's Poverty Profile (2015) Income Poverty. Available at: http://www.londonspovertyprofile.org.uk/indicators/topics/income-poverty/

36. The World Bank (2015) GINI Index (World Bank estimate)

As a result of the influx of the **super-rich** into the **inner city**,

low and middle earners

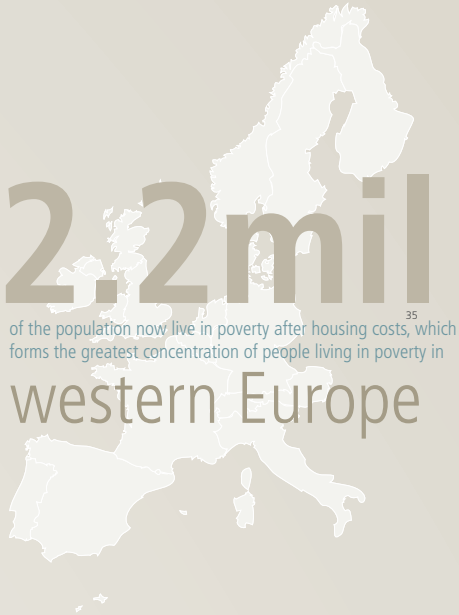
are being forced further out into the **outer boroughs** to find somewhere to live



ATKINS

CENTRE FOR LONDON

OXFORD ECONOMICS



Spatial distribution of inequality within London

It is usual for larger cities, or capital cities, to be the most unequal within a country given that they have the largest populations. However these cities often intensify inequality levels at country level. Except for Portugal, the UK is ranked as the most unequal country in western Europe.[36] Globally, the UK is one of the most unequal developed countries, although the USA ranks significantly worse.

Compared with a decade ago, when poverty was more evenly distributed in London, more people are living in poverty in outer London than inner London. Recent data[37] reveals the number of wealthy households in Inner London has increased 203% between 1980 and 2013, a level which is five times higher than the national increase. Inner London has become more exclusive for the super-rich and is becoming dominated by 'super-gentrified'[38] areas, where the rich are able to buy into areas even above the traditional upper classes, forcing housing prices up and limiting access to housing. As a result low and even middle earners are being forced further out into the outer boroughs to find somewhere to live.

Recent data reveals the number of wealthy households in inner London has increased by

203%

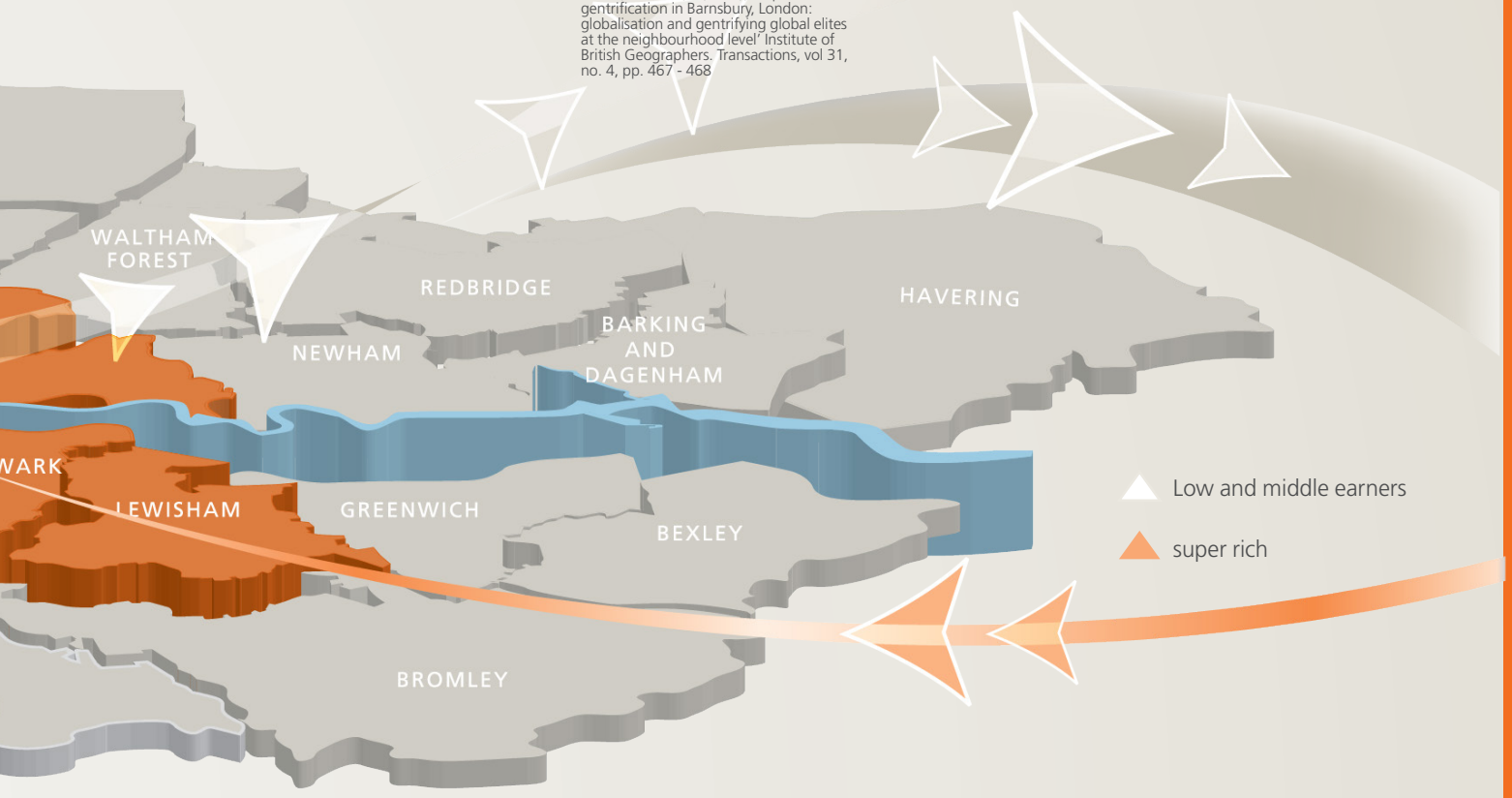
between 1980 and 2013, a level which is

five times

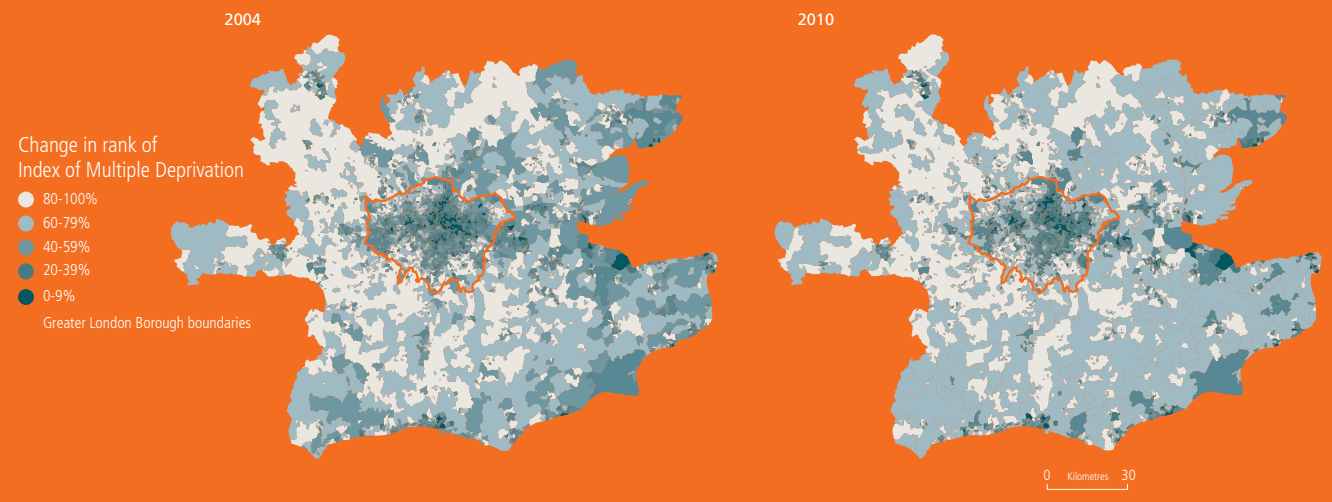
higher than the national increase.

37. Dorling, D & Hennig, B (2015) Poverty and Wealth in England and London 1980 – 2010 Available at: http://www.londonmapper.org.uk/analysis/poverty-and-wealth-1980-2010/

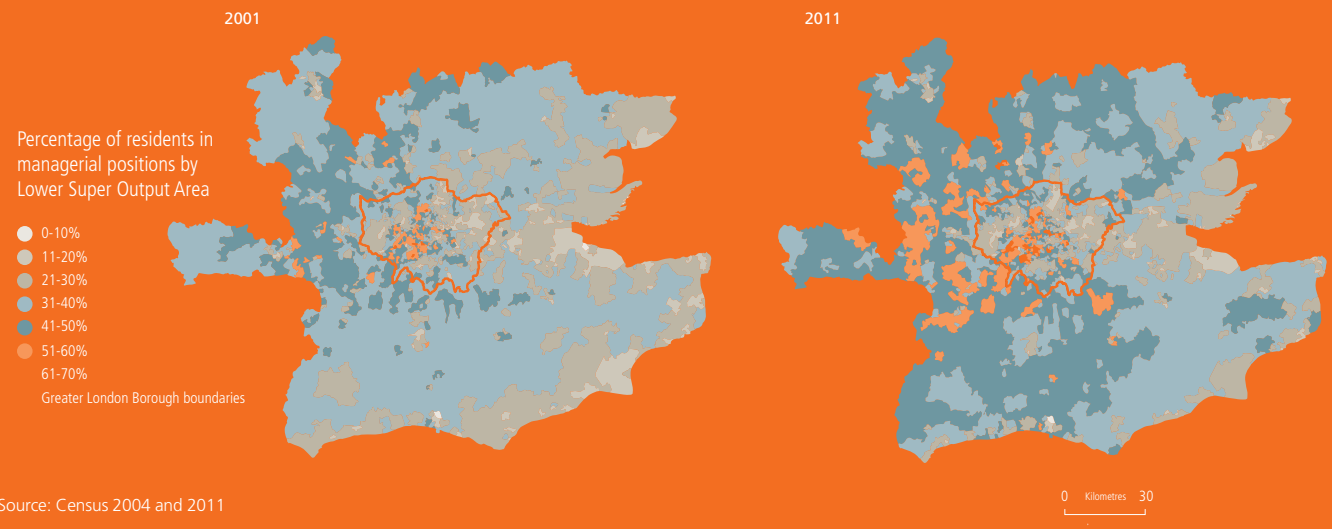
38. Butler, T & Lees, L (2006), 'Super-gentrification in Barnsbury, London: globalisation and gentrifying global elites at the neighbourhood level' Institute of British Geographers. Transactions, vol 31, no. 4, pp. 467 - 468



Map 4.10 Change in rank of Index of Multiple Deprivation



Map 4.11 Change in Managerial jobs



Source: Census 2004 and 2011

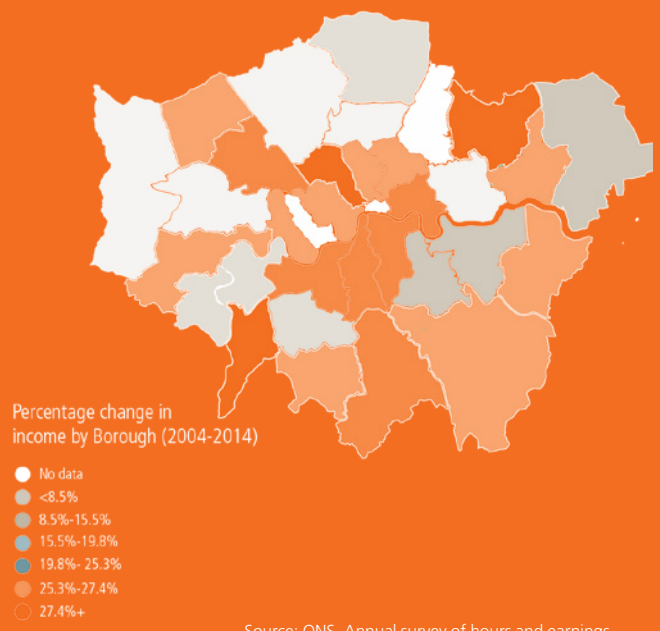
In recent years, despite London's economic growth there has been little improvement in the levels of deprivation across London. Between 2004 and 2010 there was only a 4% improvement, with fewer LSOAs appearing in the UK's 10% most deprived (Map 4.10).[39]

West London contains the lowest levels of deprivation (Map 4.10), a greater concentration of higher paid managerial professions (Map 4.11) and higher income levels in comparison to East London (Map 4.12). The greatest level of income change between 2004 and 2014 was in the south west in the Royal Borough of Kingston Upon Thames with a 35% increase in income levels.

The East London Boroughs of Newham, Tower Hamlets and Hackney all record relatively high levels of social deprivation. It is clear that access to economic opportunities is not equitably shared across the city, but for the city to effectively function it requires everybody that plays a part in its success to have access to housing and job opportunities.

In 2013, 49% of new build home purchases in inner London were from foreign buyers who did not reside within the UK[40]. The inner core of the city is dominated by wealthy people who own second homes, (Map 4.12) demonstrating the concentrated wealth in the inner city.

Map: 4.12 Change in income

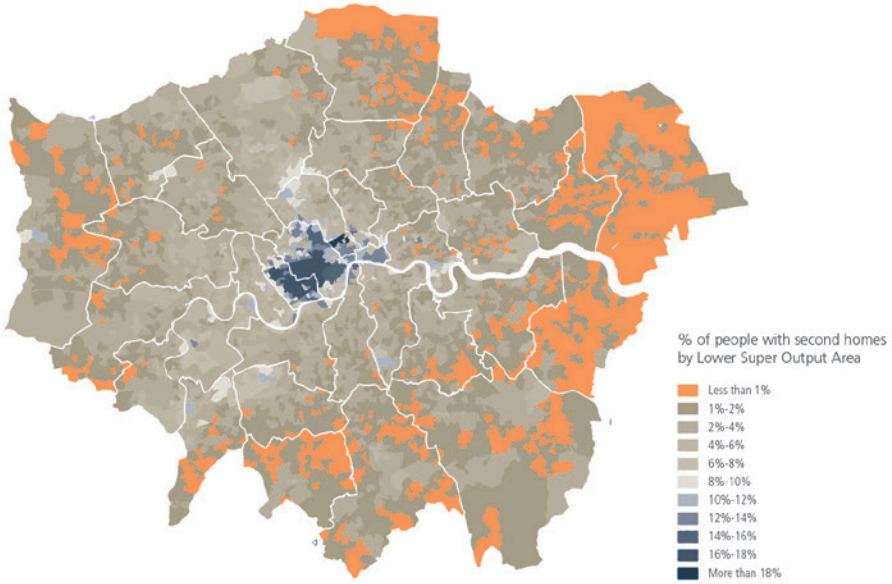


Source: ONS, Annual survey of hours and earnings

39. DCLG (2010), Index of Multiple Deprivation

40. Knight Frank (October 2013) International Buyers in London

Map: 4.13 Percentage of people with second homes

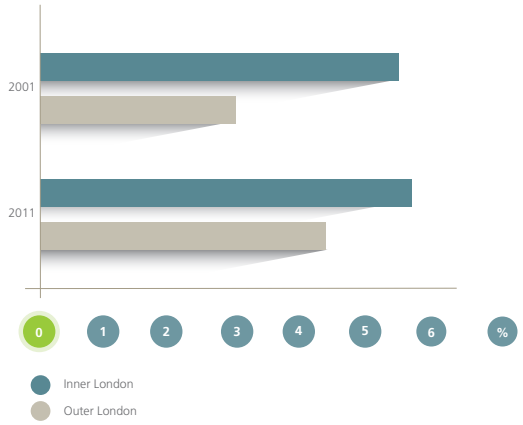


Source: ONS

The percentage of working age adults claiming job seeker allowance (JSA) has increased slightly within inner London whilst there has been a considerably larger growth identified in outer London.

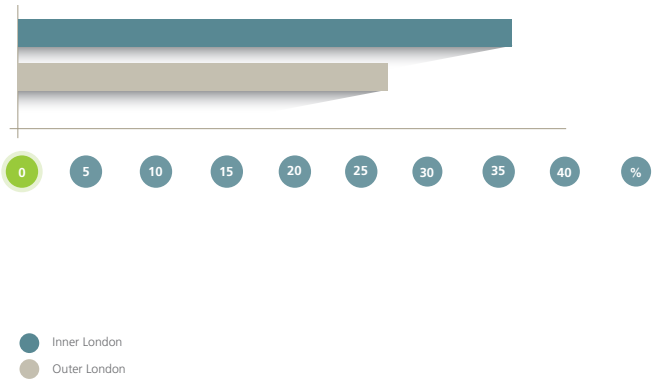
Outer London has also seen a considerably lower increase in median incomes compared with inner London, (Figure 4.3), where there is a 7% difference, with much larger difference between some inner and outer boroughs. In addition to greater concentrations of unemployment and a lower level of income growth, outer London has been one of the few places within the UK to see an increase in the proportion of children living in low income households.

Figure 4.2 Percentage of JSA claimants within working age adults in London (2001 - 2011)



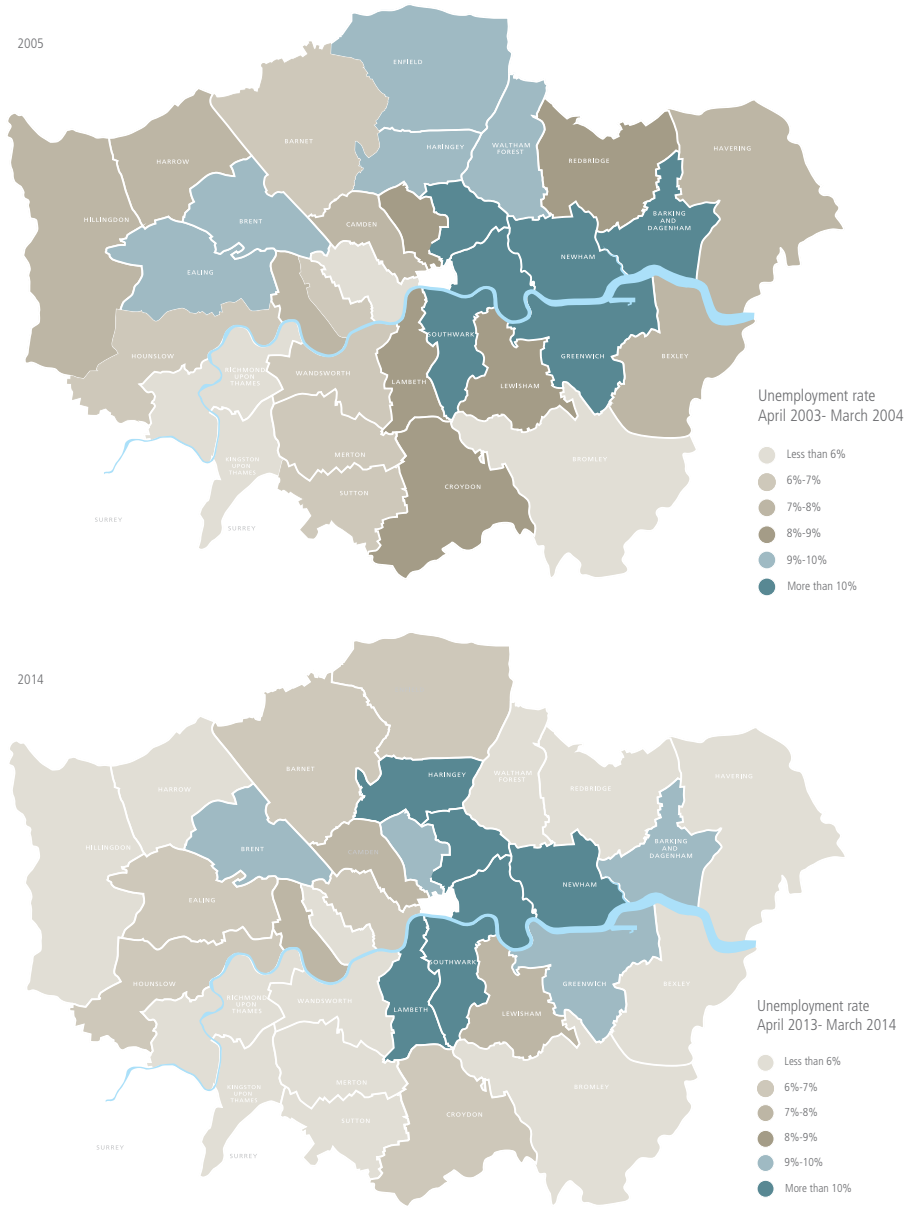
Source: ONS

Figure 4.3 Percentage increase in median income (2002 - 2012)



Source: London Datasource

Map 4.14 Unemployment rate



Source: ONS, London Datastore

Although there is a clear shift of poorer households to outer London, more detailed analysis has revealed concentrations of poverty in east London.[41] In terms of inner city economic growth the inner east boroughs such as Haringey and Hackney still fall considerably further behind others to the west.

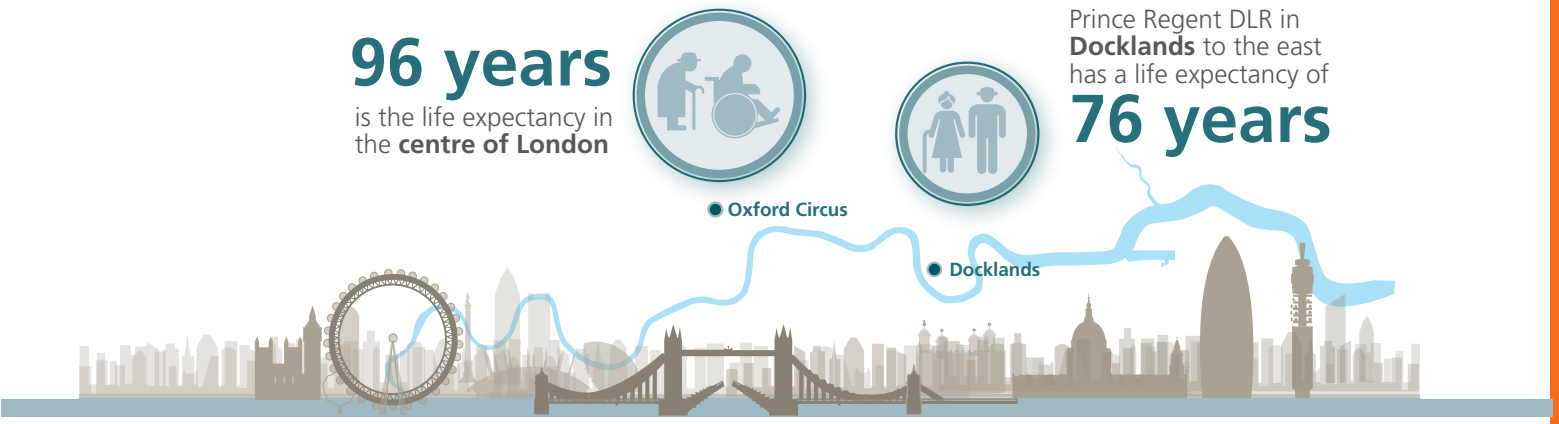
By considering the change in unemployment rates between 2005 and 2014 it is possible to see clearly that rates have increased across the capital as a whole which is in line with the entire UK. However what is noticeable also is that the east, particularly the outer east has been hit significantly worse by unemployment. For example Barking and Dagenham has experienced a 4.1% increase and Bexley a 3.3% increase, compared to an average increase across London of 1.1%.

Life expectancy

Life expectancy provides another measure of inequality in London. The correlation between increased income inequality and increased health problems is well documented, and a life expectancy 'gradient' shows people in higher socio-economic positions living longer than those in lower positions.[42]

Kensington and Chelsea, the borough with the second highest average income, has the highest life expectancy at 82.6 years compared with Tower Hamlets, the second most deprived borough, where life expectancy is 77.5.. Data on life expectancy produced by tube station shows up to a 20-year gap in life expectancy between stations. For example, Prince Regent DLR in docklands has a life expectancy of 76 compared with 96 at Oxford Circus.[43]

41. LSE Briefing (Autumn 2011) Poverty and inequality in London: anticipating the effects of tax and benefit reforms http://www.lse.ac.uk/geographyAndEnvironment/research/london/events/HEIF/HEIF4b_10-11%20-newlondonenv/briefs/lupton.pdf



The risks and consequences of growing inequality

The risks of inequality to London are considerable and affect the population at both a social and economic level, both rich and poor. Inequality may undermine growth and London's competitiveness.

Social unrest

At the extreme, inequality is a threat to society, as the gap between rich and poor widens and social instability increases.[44] Inequality strengthens class divides and weakens people's trust in others. As inequality worsens, social unrest has the potential to occur. Research shows that conflicts are more likely to erupt in areas of lower income,[45] and that various inequalities, whether it's economic, social, or cultural can heighten grievances and ultimately lead to conflict.[46]

The 2011 London riots resulted from a complex array of issues triggered by a specific event. However it is apparent that inequality played a significant role. Data shows 59% of those involved came from the UK's top 20% most deprived wards,[47] and those involved felt a sense of injustice, socially and economically, and a perceived lack of employment opportunities.

Although historically riots and social unrest occur in the centre of deprived areas[48] or city centres; during the 2011 London riots many of the hotspots were located on the boundaries of areas of the highest and lowest levels of social deprivation, in normal day to day locations, where social inequality was felt greatest.

Social mobility and the loss of human capital

It is widely accepted that within more equal societies, there is more social mobility. Today's society is one where affluent children are already at an advantage to those from lower socio-economic groups. Mobility in earnings is particularly low in the UK and the United States but higher in Nordic countries and Canada.[49] In the context of London this means that as inequality grows, social mobility is limited. The number of children in poverty will grow and their opportunities for reaching their full potential will be constrained. This will limit the human capital available to support London's growth and competitive advantage.

42. Rowlingson, K (2011) Does income inequality cause health and social problems? http://www.jrf.org.uk/sites/files/jrf/inequality-income-social-problems-full.pdf
43. http://life.mappinglondon.co.uk/
44. Oxfam Briefing Paper (2014) Working for the Few: Political capture and Economic Inequality
45. Buhaug, Halvard and Gleditsch, Kristian and Holtermann, Helge and Ostby, Gudrun and Tollefsen, Andreas Forø (2011) 'It's the Local Economy, Stupid! Geographic Wealth Dispersion and Conflict Outbreak Location.' Journal of Conflict Resolution, 55 (5). pp. 814-840.
46. Brinkman, H., Attree, L. and Hezir, S. (2013), Addressing horizontal inequalities as drivers of conflict in the post-2015 development agenda.
47. LEWIS, P. Newburn, T. & Roberts, D. (2011) Reading the Riots: Investigating England's Summer of Disorder. London: The Guardian, London School of Economics
48. Till, Jeremy (2013) The Broken Middle: The Space of the London Riots. Cities, 34 . pp. 71-74
49. OECD (2010), A Family Affair: Intergenerational. Social Mobility across OECD Countries

Inequalities risk human capital, in terms of the quality of employees, acts as a barrier to developing talent and innovation and it can lead to a skills shortage and gaps in information flows. One of the barriers to human capital results from the lower levels of social mobility; within London, children from poorer backgrounds (identified by eligibility for free school meals) are less likely to achieve 5 GCSEs A*-C. When considered in the context that 53% of projected jobs growth in London by 2036 will require degree level qualifications, shows that increasingly those with lower skills will find it difficult to access employment opportunities in London.[50]

London's common wealth

London is famous for the world-renowned museums, theatres, parks and open spaces. These assets comprise London's 'common wealth' as many are free entry to Londoners and visitors. However entry for London research highlights that many Londoners are unable to access London's common wealth. Increases in the cost of living mean that around a fifth of Londoners now fall into a category termed ENDIES (Employed, No Disposable Income or Savings). After paying for rent and other essentials this group are left with little or nothing to spend on leisure activities or the sorts of days out with the family that many people take for granted. Detailed qualitative research shows this group is often unable to afford to access the free attractions in London simply because of the cost of travel from outer boroughs. Socialising with friends is also seen as challenging when you have no money to spare. As a result, many spend most of their evening and weekends at home. The dual dynamics of the suburbanisation of poverty and the squeeze on living standards means an increasing number of Londoners are unable to access the shared assets and experiences that makes London a world city.

There are both strong moral and welfare reasons for ensuring that Londoners can access the common wealth of their city. Economists and philosophers from Adam Smith to Amartya Sen have argued we should understand poverty in terms of what is required to participate in society.[51]

More recently, social scientists and epidemiologists have shown that lack of social contact is a crucial determinant of people's happiness and wellbeing.[52] They have also shown that poor social networks are a powerful determinant of physical health.[53] There is a clear need to ensure that all Londoners can participate in, and enjoy the shared life of their city.

Volatile growth

Another issue is that inequality can make growth more volatile and create unstable conditions for growth, because as lower income groups have less money they spend less and increase borrowing. Evidence suggests a systemic link between low income households accumulating more debt,[54] populations may also vote for higher taxation and show less support for pro-business growth policies. Discussions[55] suggest that more equal societies seem to drive more durable growth, proven by evidence that fiscal redistribution has little effect on growth.

London must therefore address inequality to ensure the future of the city remains competitive. Although at present the city remains attractive to employers, it is becoming an increasingly unaffordable place to live and more polarised and as a result is likely to become a less desirable place to live and work and invest.

50. Greater London Authrotity (2013)London Labour Market Projections

51. http://housingforall.org/Social_exclusion.pdf

52. http://www.sciencedirect.com/science/article/pii/S0167487007000694

53. http://journals.plos.org/plosmedicine/article?id=10.1371/journal.pmed.1000316

54. Coibion, O, Gorodnichenko, Y, Kudlyak, M and Mondragon, J (2014) Does Greater Inequality Lead to More Household Borrowing? New Evidence from Household Data. NBER Working Paper No. 19850

55. Ostry, J. et al., 2014, "Redistribution, inequality, and growth", International Monetary Fund Staff Discussion Note, SDN/14/02, International Monetary Fund

Risk: London's environment becomes more degraded

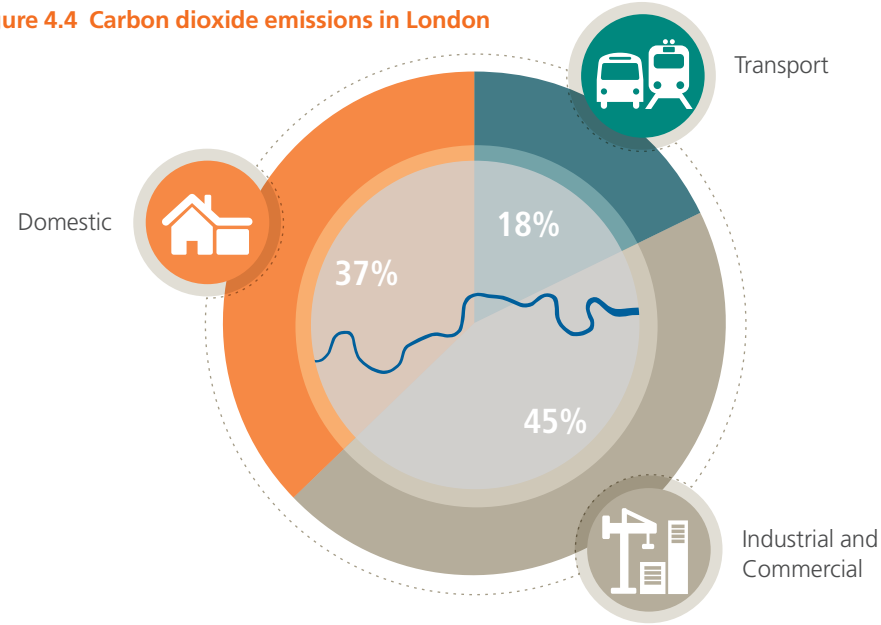
The rapid growth of London brings increased pressures on the environment. London contains some of the highest population densities in the UK and its growing population, new homes and associated infrastructure will be particularly vulnerable to the impacts of climate change, such as flooding and increased water scarcity. Climate change problems felt across the UK are exacerbated in London given the dense nature of the city.

The degradation of the wider environment poses social and economic risk to the population. The need to both maintain and improve current environmental systems is vital to ensuring London remains attractive as a place to live work and invest.

Carbon dioxide

Carbon dioxide (CO_2) is the primary greenhouse gas related to climate change. London is a major contributor to CO_2 emissions, and represents 11% of England's overall CO_2 emissions. The majority of CO_2 emissions come from industrial and commercial uses, which is dominated by electricity consumption[56] (Figure 4.4). Current carbon dioxide emissions are accumulating in the atmosphere approaching a level that will make it impossible to maintain the global mean temperature increase within two degrees of the pre-industrial average. London and other cities across the world need to reduce CO_2 emissions to reduce the impact of climate change.

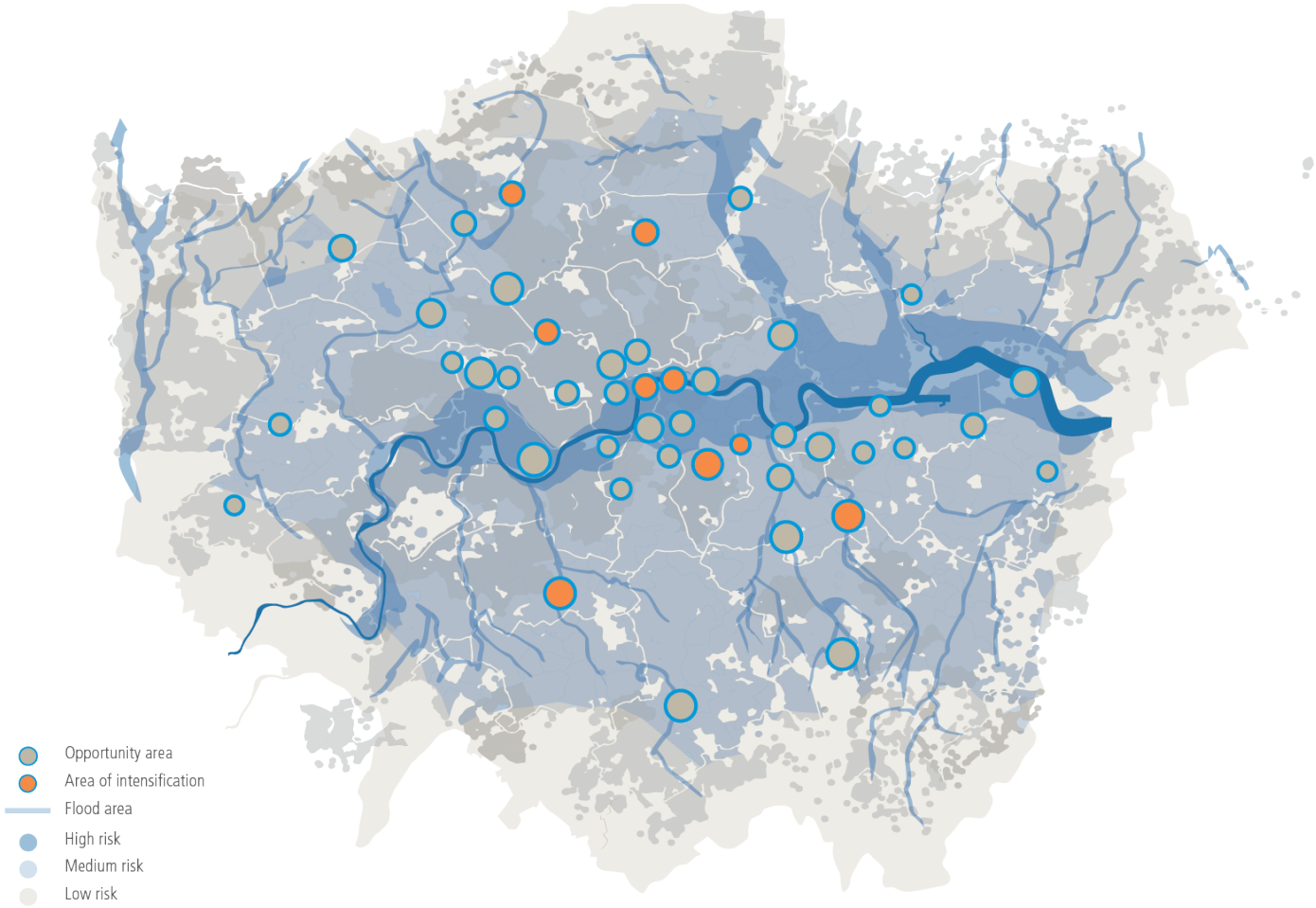
Figure 4.4 Carbon dioxide emissions in London



Source: Department of Energy and Climate Change - Local authority carbon dioxide emissions estimates 2012

56. Department of Energy and Climate Change - Local authority carbon dioxide emissions estimates 2012

Map 4.15 London Plan opportunity areas and flood risk in London



Source: Environment Agency, London Plan

Flooding

Approximately 1 million people are located within the flood plain in London[57] with 300,000 homes at risk of flooding from the Thames.[58] Within the Tidal Thames floodplain, over 500,000 homes, 40,000 commercial properties, 35 tube stations, 51 rail stations, 300 km of roads, 400 schools are located.[59] There is significant risk to property, life and business without adequate protection. Despite the Thames Barrier, London's tidal flood defence system, the risk of tidal flooding is becoming more frequent and the Environment Agency (EA) reports that the Thames Barrier has been raised 141 times since 1982 but it was closed more than 100 times since 2000 and 13 times in January 2014 alone.

However there are much lower standards of flood risk protection against river flooding and surface water flooding in London. The frequency of extreme daily rainfalls (>40mm) has been increasing[60] and is expected to continue to increase, with predictions of a double in frequency by 2080[61].

57. Environment Agency (2009), Flooding in England a National Assessment of Flood Risk https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/292928/geho0609bqds-e-e.pdf

58. Groundsure (2015) Hammersmith and Fulham at highest risk of flooding http://www.groundsure.com/blogs/hammersmith-and-fulham-properties-highest-risk-flooding

59. Environment Agency (2011), Thames 2100 plan

60. Lloyd's (2010) East London Extreme Rainfall - Importance of granular data

61. Climate UK (2012) A summary of climate change risks to London

Increased surface water puts additional pressure into sewer systems and can lead to flash flooding. An estimated 800,000 homes have been identified[62] within London as being at risk of surface water flooding. Given the urban structure and lack of permeable areas,16 of London's boroughs are identified in the top 20 districts in England as susceptible to surface water flooding.[63]

London faces unprecedented population growth pressures. This will lead to the need to develop and intensify development, sometimes in areas with higher environmental risks, such as flooding. Fifteen of the opportunity areas identified in the London Plan are located directly within the flood risk zone, which represents over 50% of the 250,000 opportunity area housing capacity and over 286,000 potential jobs (70% of the total). These new areas for homes and business increase the number of people at risk from flooding, and risk to life, property and business. Some of the most deprived population live within flood risk zones, largely in the east. The social impacts on these groups of people are likely to be considerably higher than others, as they are less likely to afford flooding insurance.[64]

Water scarcity

Although much of London is within the flood zone, London is the 15th most water stressed city in the world,[65] and faces severe water scarcity. As the population rises so does the demand for water and there is a deficit of 50 million litres of water a day expected by 2050.[66]

Scarcity reduces access to drinking water. Economic growth has been proven to be dependent on access to safe drinking water and lack of access to water also has been found to negatively affect human capital. In addition to the human and social impact of a reduction in water supply, scarce water supplies can disrupt power generation and many manufacturing industries, potentially slowing economic development and reducing the support for the growing population.[67]

Alternative water supplies such as desalination, water importing and creating new reservoirs are costly and would require significant financial investment. However if demand is not reduced, a lack in water supply to both industrial and domestic sectors could hinder growth.

Heat

Urban Heat Island (UHI) refers to the phenomenon of higher temperatures in urban areas compared to the 'normal' temperatures in outlying areas. Cities like London are particularly susceptible to UHI effect due to the high-rise form and density of the city. By 2050, it is predicted that one third of London's summer temperatures may exceed the Met Office's current heat wave threshold (32°c daytime and 18°c night time).[68]

There is an estimated 1,100 heat-related premature deaths in the UK a year.[69] In addition high temperatures exacerbate air quality issues and cause illnesses, sickness and respiratory issues.[70] The increased heat discomfort may lead to decline in labour productivity due to illness and commuting and travel disruptions as a result of rail tracks buckling and speed restrictions on tube and rail. This could lead to further drops in labour productivity.

Excess heat may also add pressure to energy demand as a result of increased use of air conditioning and increasing CO_2 emissions and in the worst case, adding pressure to water demand.

62. Climate UK (2012) A summary of climate change risks to London

63. DEFRA (2009) National Rank Order of Settlements Susceptible to Surface Water Flooding http://archive.defra.gov.uk/environment/flooding/documents/manage/surfacewater/sw-settlement-order.pdf

64. Gordon Walker, Kate Burningham, Jane Fielding, Graham Smith, Diana Thrush and Helen Fay (2006) Addressing Environmental Inequalities: Flood Risk, Science Report: SC020061/SR1. Environment Agency, Bristol

65. McDonald, R.; Weber, K.; Padowski, J.; Flörke, M.; Schneider, C.; Green, P.; Gleeson, T.; Eckman, S.; Lehner, B.; Balk, D.; Boucher, T.; Grill, G.; Montgomery, M. (2014) Water on an urban planet: urbanization and the reach of urban water infrastructure

66. Greater London Authority (2015) London 2050 : Bigger and Better

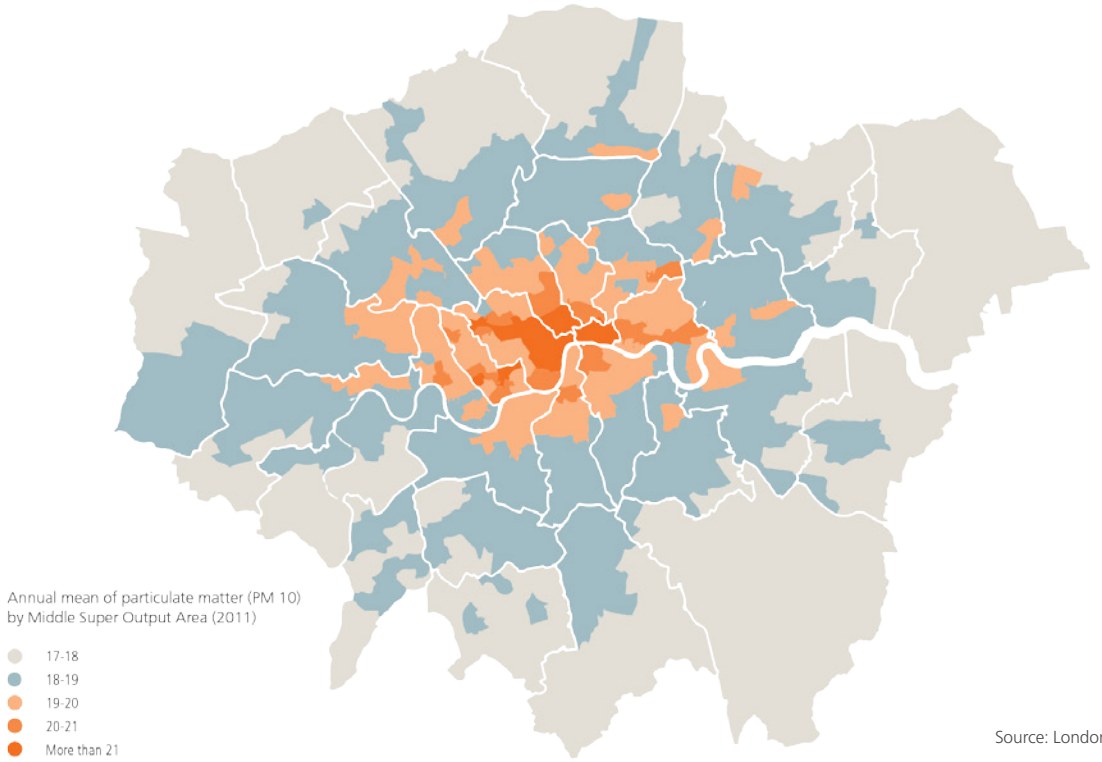
67. Fogden, Josephine (2009) "The Impact of Access to Safe Drinking Water." Access to Safe Drinking Water and Its Impact on Global Economic Growth (2009)

68. Climate UK (2012) A summary of climate change risks to London

69. http://climatelondon.org.uk/projects/overheating-thresholds/

70. Climate UK (2012) A summary of climate change risks to London

Map 4.16 Annual mean of particulate matter (PM 10) by Middle Super Output Area (2011)



Source: London Datastore

Air quality

The size and density of London makes it one of the most polluted places in the UK and unless suitability managed this will only worsen as the population increases. London is ranked 17th out of 36 global cities in terms of traffic related pollution.[71] Poor air quality is a harm to human health and an estimated 4,267 Londoners die prematurely each year from long term exposure to airborne pollution.[72]

The majority of London's pollution comes from transport and congestion, which is exacerbated by the city's high density and proliferation of tall buildings. The additional growth in London will result in additional trips being generated which could have a large impact on total emissions, presenting further challenges to improving air quality.

Particulate matter, such as PM10 or PM2.5, are some of the most hazardous to human health due to their ability to penetrate deep into human lungs. The greatest concentration of particulate matter (PM10) which largely emerges from engine emissions and tyre and brake wear, is in inner London, although west London and main transport corridors to the north also are shown to experience higher emissions (Map 4.16).

The economic costs of air pollution on London are associated with the health impacts of worsening air quality and the consequent effects upon the labour supply. Long term exposure to air pollution can lead to serious symptoms and conditions which affect human health and the World Health Organisation states that a reduction in air quality can reduce heart disease, lung cancer and respiratory diseases. The impacts of poor air quality on human capital is from a young age, and growing evidence links air pollution to measurable increases in school absences and pupils performing worse in exams.[73] It seems that even exposure to air pollution while in the womb also has a measurable impact on exam results in later life.[74] The next generation is therefore already being affected by air pollution through their exposure from a very young age.

Risks and consequences of environmental issues

The urban nature of London makes it a hot spot for environmental risks as a result of climate change. An increased population will exacerbate existing poor air quality, water scarcity, flood risks, urban heat island effects issues, which can decrease quality of life in London. However a focus on environmental issues also poses an opportunity for London to embrace change and invest into low carbon and circular economies, and associated new technologies. Investment in new technology will allow London to become more environmentally sound but also become more competitive on a global scale by tapping into the financial and economic benefits of new technologies.

71. AMEC (2014) Comparison of Air Quality in London with a Number of World and European Cities

72. GLA (2008) Air Quality and Health. Available at: https://www.london.gov.uk/priorities/environment/clearing-londons-air/air-pollution-and-public-health

73. Zweig, J. S., Ham, J. C., & Avol, E. L. (2009). Air pollution and academic performance: evidence from California schools. Work. Pap. Dep. Econ., Univ. Md. by VALE Trial Account on, 5(20), 14.
Miller, S., & Vela, M. A. (2013). The Effects of Air Pollution on Educational Outcomes: Evidence from Chile.
Gilliland, F. D., Berhane, K., Rappaport, E. B., Thomas, D. C., Avol, E., Gauderman, W. J., ... & Peters, J. M. (2001). The effects of ambient air pollution on school absenteeism due to respiratory illnesses. Epidemiology, 12(1), 43-54.

74. Sanders, N. J. (2012). What doesn't kill you makes you weaker prenatal pollution exposure and educational outcomes. Journal of Human Resources, 47(3), 826-850.

What will the risks mean for London?

Our diagnosis of risks to London's competitive advantage has identified four key risks:

London doesn't meet its predicted housing needs.

London's economy becomes unbalanced.

London's society becomes more unequal.

London's environment becomes degraded.

What would these risks mean for London's future and how will the city look in 2050?

London in 2050

A continuing undersupply of housing has driven the cost of central London real estate beyond the reach of all but the wealthiest, forcing an increasing number of people to find homes in outer London or elsewhere. The cost of living rises considerably driven by house prices. Those that can afford a home often find they have to live in overcrowded accommodation which is having a severe impact on health and quality of life.

Inequality continues to grow and is resulting in social unrest. This has impacted on London's reputation as a safe and stable city. Social mobility becomes increasingly restricted and has become a barrier to developing talent and innovation. A growing number of people can't access the common wealth that London has to offer, which has implications for people's happiness, wellbeing and health.

The economy is focused on a narrow range of sectors making finding a job for those with fewer skills increasingly difficult. Employment continues to agglomerate in central London, forcing commuters to travel from ever increasing distances to access jobs. London's transport infrastructure is placed under ever greater strain to cope with the demand for commuting. Much of London's industrial land has been converted to residential or other uses, meaning those businesses that support the London service economy cannot find premises and this is limiting growth.

London's major opportunity areas have been developed in a traditional way that perpetuates the patterns of development that have prevailed in the past 20-30 years. This is a London based on 'big bang' development and large scale infrastructure projects that are less flexible and adaptable to the future economy and environment. Infrastructure investment has continued to focus on grand projects often at the expense of alternatives that are less imposing and have more wide ranging benefits. Development addresses only a limited range of employment sectors and fails to provide an adequate mix of housing to accommodate a diverse range of people. Development continues to be dominated by cars and fails to provide good quality networks of green infrastructure and public realm.

The impacts of climate change including increased flood events, extreme weather (droughts and storms) and increased temperatures are now common in the city. Damage to homes, businesses and critical infrastructure is significant and proving costly to the economy by placing additional costs on businesses and dissuading investment in the city.

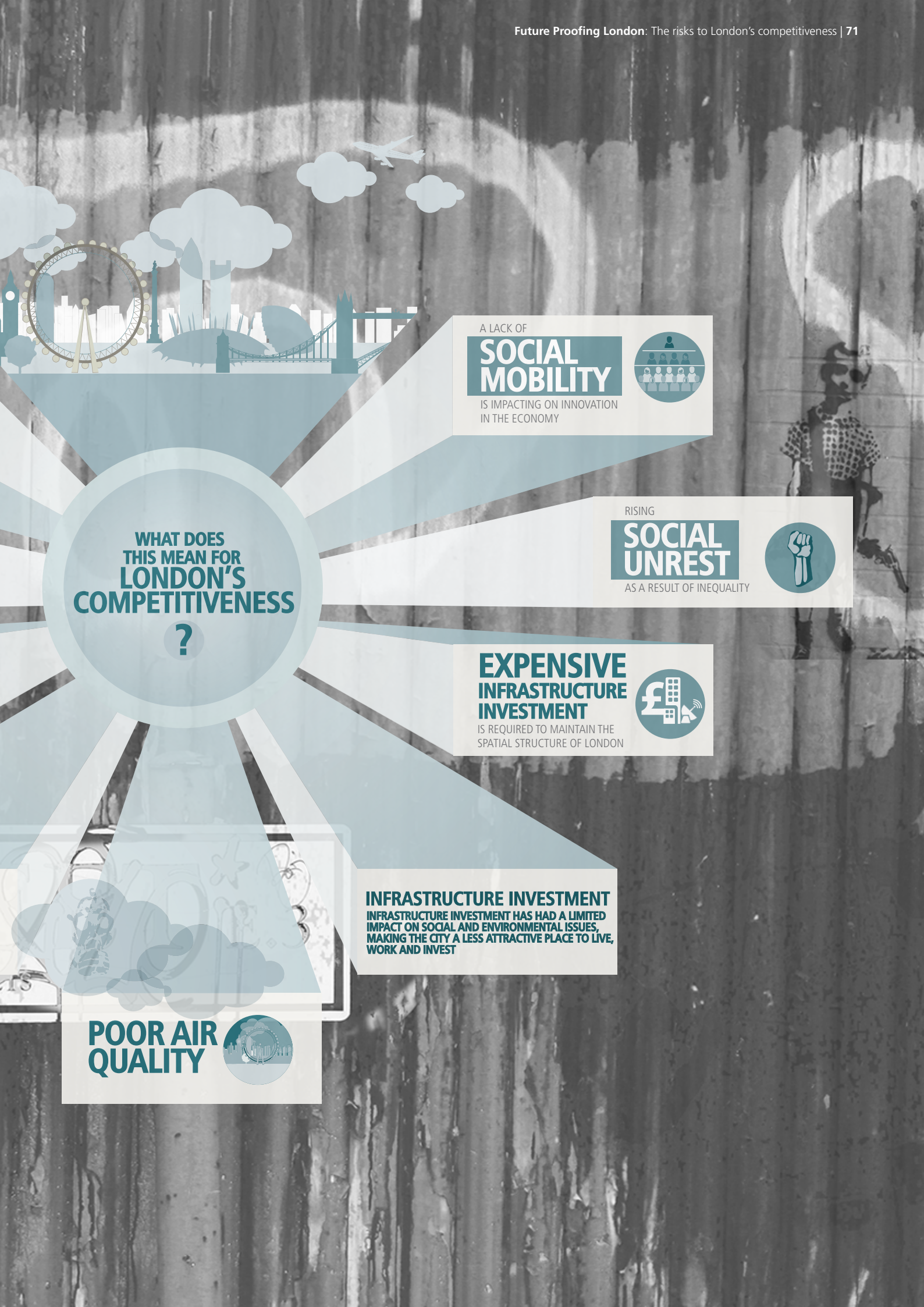
The city has failed to deal adequately with air quality issues and this is having economic consequences as poor health is impacting on productivity, and a generally poorer environmental quality is impacting on labour supply.

Scenario 1.

A London that has lost its competitive edge

How will London look if the risks are not addressed?

- Rising social unrest as a result of inequality impacts on London's ability to attract investment and talented people.
- A lack of social mobility is impacting on innovation in the economy.
- Expensive infrastructure investments are required to maintain the spatial structure of London.
- The economy becomes less diverse as growth sectors find it hard to find talent and accommodation, which reduces London's ability to adapt to future changes in the global economy.
- The city is less resilient and more prone to global economic shocks as the economy is less diverse.
- Development is designed to accommodate the current needs of business rather than planning for a more digitally advanced future economy that has different requirements.
- Infrastructure investment has had a limited impact on social and environmental issues and as a result the city is a less attractive place to live, work and invest.
- Environmental issues such as flood events are adding to business costs and placing critical infrastructure at risk.
- Poor air quality is affecting people's health which in turn is impacting on productivity.


WHAT DOES THIS MEAN FOR LONDON'S COMPETITIVENESS ?
A LACK OF SOCIAL MOBILITY IS IMPACTING ON INNOVATION IN THE ECONOMY
RISING SOCIAL UNREST AS A RESULT OF INEQUALITY
EXPENSIVE INFRASTRUCTURE INVESTMENT IS REQUIRED TO MAINTAIN THE SPATIAL STRUCTURE OF LONDON
INFRASTRUCTURE INVESTMENT INFRASTRUCTURE INVESTMENT HAS HAD A LIMITED IMPACT ON SOCIAL AND ENVIRONMENTAL ISSUES, MAKING THE CITY A LESS ATTRACTIVE PLACE TO LIVE, WORK AND INVEST
POOR AIR QUALITY

LEAS
MORE
WE NEED
APARTMENTS!

LONDON'S CAPACITY TO ACT

CENTRE FOR LONDON
OXFORD ECONOMICS

London's capacity to act

The extent to which London's competitive advantage will be threatened by the risks that we have identified will depend on London's capacity to act. London has a number of strengths related to governance, planning, finance and delivery systems and its economy. This is London's capacity to respond to the risks it faces. By considering London's existing capacity to act we have highlighted areas that could be strengthened in order to meet the key risks that London faces.

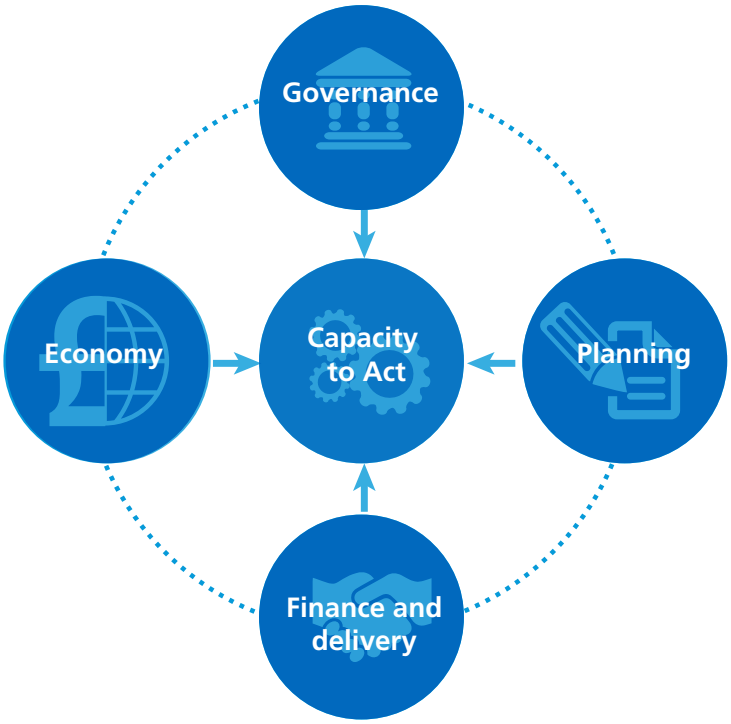
What do we mean by capacity to act?

London's capacity to act is focused on four cross-cutting and interrelated issues: economic strength and diversity, urban governance, urban planning and finance and delivery mechanisms. These overlap and interact in complex ways to help shape the city's capacity to respond to the risks it faces now and in the future.

- **Governance** – the strength of governance in London is crucial to how the city responds to the future. Governance in London is multi-levelled, meaning the interactions upwards between the Mayor and Greater London Authority and the UK Government, are as important as the interactions downwards with the 32 London Boroughs and the City of London. The strength of coordination between the different levels of government will be critical. Increasingly London must also look beyond its current boundaries and collaborate with local authorities surrounding the capital on issues such as housing and transport. Another essential element of governance is the coordination of activities between different sectors including the public, private and the voluntary sectors.
- **Planning** – effective urban planning is crucial to London's ability to respond to the risks it faces as it plays a key role in shaping and controlling land use, urban form and infrastructure delivery. In London the strategic direction of urban planning is set at both the regional level through the Mayor and at the local level through the local authorities. Both the London Plan and local plans are guided by overarching policy principles set at the national level through the National Planning Policy Framework (NPPF). Planning decision making is made at both the regional and local level depending on the scale of development coming forward.

Cities devolution
The Government has recently announced a Cities Devolution Bill. English cities are expected to be given the power to assume greater responsibilities over housing, infrastructure and health care. There could also be scope for cities to retain a greater proportion of business rates and potentially taxes such as stamp duty. If London does benefit from greater devolution it could greatly strengthen its capacity to act.

Figure 5.1 What do we mean by capacity to act?



- **Finance and Delivery** – the ability of London to marshal finance from the public, private and voluntary sectors is crucial to helping to deliver investments that can respond to current and future risks. London has limited control over its finances as much of the funding for infrastructure and service delivery is centrally funded and much of the tax raised in London is not kept there. Effective delivery models to bring forward affordable housing, infrastructure and services are key. Delivery of infrastructure which responds to risks may require some changes in the way they are commissioned, designed, built and maintained.
- **Economy** – a strong and diverse economy will help London to deal with current and future. London is currently well positioned in growing and high value markets. London's economic health is strong now (with GVA per capita of approximately £40,000) but it is important that London's economic health keeps pace with projected population growth as the two are linked. Between 2013-2040 London's GVA per capita is expected to see average growth at 1.5 times its population growth.[75] This continued economic growth compared to the city's population growth, would should strengthen London's ability to respond to risks (through an increase in resources to invest in dealing with risks), but economic growth shouldn't be pursued without considering the environmental and social risks that are anticipated.

Our work has focused on the issue of planning and its influence on London's capacity to act on the identified risks, because planning is an area over which London has the most control. Planning also cuts across land use planning and infrastructure. The interrelationship of infrastructure and planning is of critical importance as delivery of infrastructure can play a significant role in dealing with risks associated with housing, economy, society and environment.

75. Oxford Economics (Feb 2015), London 2030 Study, Paper 1: Baseline forecast

Why is infrastructure planning important?

Given the £1 trillion investment that may be required to support London's future growth, planning and development of infrastructure offers a great opportunity for building London's resilience to risks. But we need to get infrastructure planning and investment right.

Infrastructure can contribute towards retaining London's competitive advantage by tackling some of the city's key risks in relation to housing shortages, economic imbalance, social inequality and poor environment.

Figure 5.2 Delivery of infrastructure can have multiple benefits that contribute to retaining London's competitive advantage.

Table 5.1 Opportunities from infrastructure investment

Risks to London's competitive advantage	Opportunities from infrastructure investment
London does not meet its predicted housing needs	Unlock new development
London's economy becomes unbalanced and fails to provide opportunities for all Londoners	Nurture a diverse economy
London's society becomes more unequal	Create an inclusive city
London's environment becomes more degraded as a result of growth	Improve the attractiveness of the environment

Links between infrastructure and housing shortages

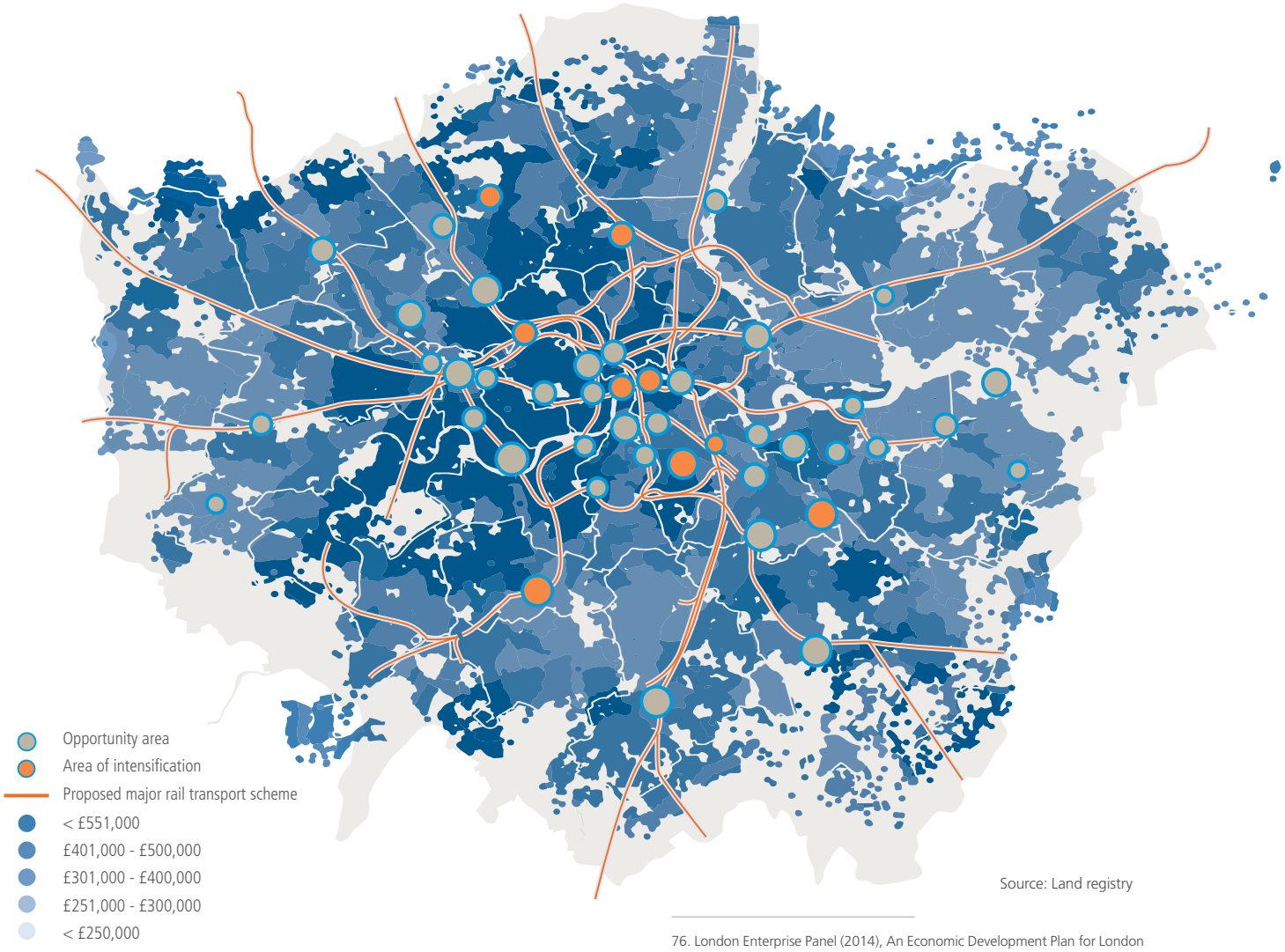
Infrastructure can unlock new developments in our cities. Improvements in infrastructure can increase the attractiveness of a location, thereby increasing demand and property values thus making sites more attractive for development, facilitating redevelopment opportunities, increasing densities and unlocking places for new housing.

The London Plan identifies Opportunity Areas as London's major source of brownfield land with significant capacity for new housing and commercial development (typically accommodating at least 2,500 new homes or 5,000 new jobs) and other supporting development. Unlocking these strategic sites relies upon improvements in infrastructure (Map 5.1) and the environment, including public transport, public realm improvements and a mix of supporting community facilities.

However, whilst infrastructure improvements can release development sites for new housing, there is also the less desirable effect of inflating house prices. London properties which are close to public transport stations are more expensive than the areas with poorer public transport connectivity. It is crucial that the delivery of infrastructure improvements considers measures to prevent people being priced out of living in their local area.

London's competitive advantage relies upon access to a varied labour force in order to support local business activities and deliver major projects, such as housing and infrastructure. Unlocking London's Opportunity Areas and intensification of existing residential areas are both important in providing new homes for the capital. However it is important to consider how affordability in London's housing stock can be better controlled to ensure local people who are an important part of London's labour force are not priced out of the housing market.

Map 5.1 London's major development locations



Source: Land registry

76. London Enterprise Panel (2014), An Economic Development Plan for London

77.Oxford Economics (Feb 2015), London 2030 Study, Paper 1: Baseline forecast

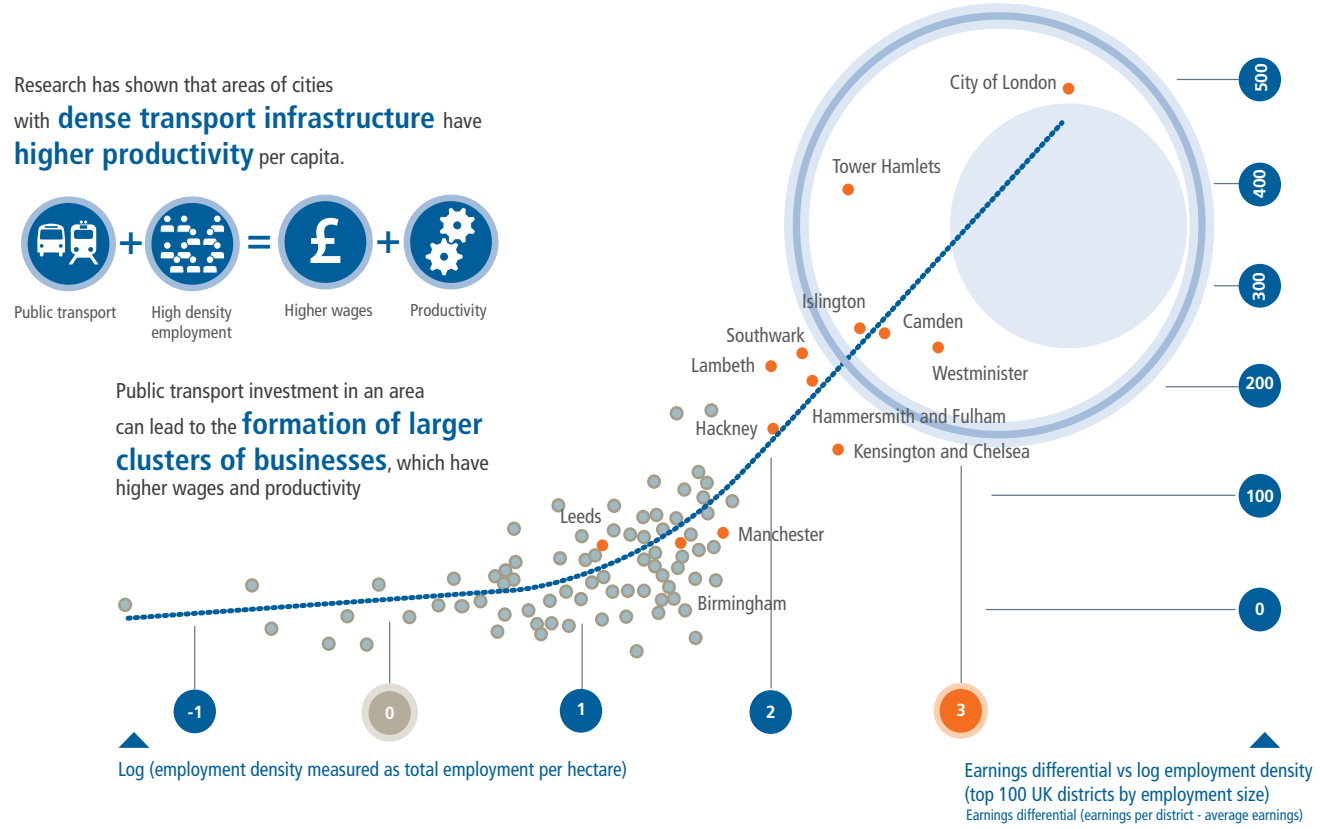
Links between infrastructure and the structure of the economy

Infrastructure is critical for future proofing London's economy. According to the London Enterprise Panel, sustaining economic growth is likely to require further diversification of the economy including growth in the tourism, entertainment, creativity and technology sectors.[76] The London Plan (March 2015) outlines the Mayor's commitment to supporting emerging new sectors such as technology, media and telecommunications (TMT). The Oxford Economics baseline forecast for London's future growth up to 2030[77] predicts that jobs growth in inner London will be driven primarily by the professional, scientific and technical services sector (178,000 additional jobs). In contrast in outer London, projected employment growth is more evenly spread between sectors. The professional, scientific and technical sector still leads with 56,000 additional jobs created in the period to 2030. It is therefore essential that London is able to provide a diverse range of workspaces, environments, skilled workforces and supporting infrastructure (transport connectivity, high-speed broadband) so that enterprises of all types and sizes can start-up, grow and innovate.

Research has shown that areas of cities with dense transport infrastructure have higher productivity per capita.[78] Public transport investment in an area can lead to the formation of larger clusters of businesses, which have higher wages and productivity. Business clustering is important for London's economic development and building local economic resilience. The agglomeration of businesses in an area not only encourages the sharing of resources and healthy competition but can also produce external benefits that all businesses share in.[79]

Resource constrained SMEs can benefit from being associated with a business cluster, as the critical mass of complementary businesses can enable access to essential infrastructure (especially digital infrastructure) along with skills, services and knowledge that can drive innovation and product development. Being in a business cluster community can also help start-ups to raise their profile and build their reputation to compete in the global marketplace. In addition, strong business clusters also attract talented and highly skilled professionals with a greater diversity of skills that will drive innovative product development.

Improved connectivity in such highly productive business clusters (like East London's Tech City) brings economic benefit.[80] However infrastructure improvements can also lead to higher rental values that may push out some start-ups, as recently seen with 'Silicon Roundabout', where some start-ups have been replaced by larger firms.[81] London's competitive advantage depends upon maintaining a diverse economy by supporting clusters that can accommodate a mix of businesses, of different sizes and with different but interrelated activities.



Source: London Infrastructure Plan 2050: Transport supporting paper

78. D.G. Chatman & R. B. Roland, Urban Studies (2013), Transit Service, Physical Agglomeration and Productivity in US Metropolitan Areas

79. London Councils (2014), Supporting London's Business Clusters, Final Report

80. London First (2012), London, Britain and the World: Transport Links for Economic Growth

81. Financial Times (2013), London Start-Ups Beyond Silicon Roundabout, http://www.ft.com/cms/s/2/873a72d4-51fc- 11e3-8c42-00144feabdc0. html

Links between infrastructure and social outcomes

Ensuring new infrastructure investment benefits the less well-off will not be straightforward. The steady suburbanisation of poverty in London means those on low incomes increasingly live in outer areas of the city, which are less well served by infrastructure of all kinds, and harder to connect to existing networks. Adding to this difficulty, the literature on house price determination shows clearly that new infrastructure such as rail lines, parks, and good schools push up house prices (or rents) in the vicinity, threatening to 'price out' low income Londoners living nearby.[82]

Creating a more inclusive London will require sustained efforts across a range of policy areas. The focus of our work is on one of these, infrastructure, given that the wave of capital investment required to manage London's growth provides a trillion pound opportunity to build a more inclusive city.

We do not believe infrastructure to be the most important or most effective way to make a city more inclusive. Education and skills are likely to be more important, for example. However, there is an opportunity presented by the enormous scale of investment required in London in the next few decades. If we are to spend around a trillion pounds on infrastructure, we should think carefully about how this can be done in a way that benefits all Londoners.

Why is an inclusive city important?

There are three key components of why an inclusive city is important.

People should be able to afford to live there in the first place – low and middle income Londoners are struggling to afford their housing costs – deficit of housing has something to do with this. Those on lower and middle income are being forced to move away to cheaper areas, or leave London altogether. This often means they are losing their support network. Research from the 1950s by Michael Young highlighted the continued importance of family support for those on the lowest incomes.[83] As shortages of low skilled labour occur, wages are bid up, which in turn would result in cost increases across the city. At the higher end of the skills distribution, estimates show that the effects of house prices dissuading young professionals from moving to London will result in £85m of lost GVA in the next 10 years.[84]

Those that live there should be able to participate and enjoy life in the city – Enjoying city life means being able to access the common wealth of the city the shared, social and often free elements of the city (such as parks, museums cultural events, sports facilities etc.) that make it an exciting and rewarding place to live. Increasingly some Londoners are cut off from this common wealth. Whilst poverty has become increasingly suburbanised the common wealth of London remains heavily concentrated in central London (see Figure 5.4).

82. Alex Fenton (2001 to 2011), Growth, housing and the spatial distribution of poverty in London

83. Michael Young, Family and Kinship In East London, 1957.

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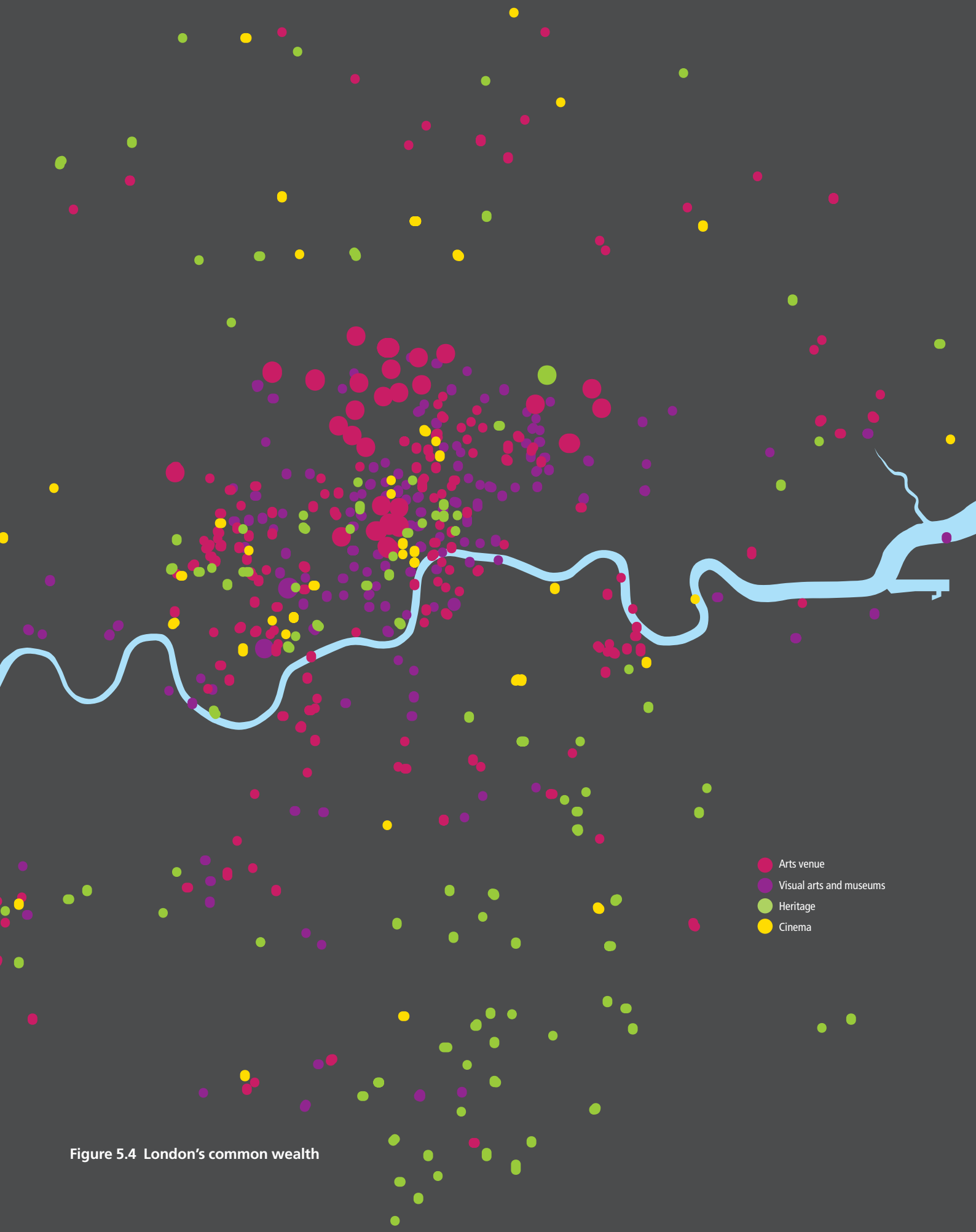

Figure 5.4 London's common wealth

The welfare of future generations should be considered - Deteriorating air quality already has significant health costs for the capital and there is some research that air pollution can impact on school absence and exam performance. The next generation of Londoners could already be paying the price for air pollution. If infrastructure investments lock in new patterns of movement and development for generations to come, it is important to ensure new investments do not sustain dangerously high levels of airborne pollution.

We should aim to create a London that remains an inclusive city, in which all residents (present and future) can share in and enjoy its abundant common wealth. Using this principle to guide decision making creates a realistic but challenging vision for what infrastructure investment should seek to achieve in London. Realistic, because the tools available to London policy makers can make a real difference. And challenging because, as we have seen, access to London's common wealth is declining, and looks set to decline further on present trends. Failure to achieve this goal, on the other hand, will result in significant economic, social, and environmental costs for Londoners.

The challenge of developing infrastructure that benefits all

London has several concentrated areas of disadvantage so investing in high quality infrastructure such as transport links in these areas would seem an obvious way to ensure that benefits reach these groups. However a large body of careful economic research shows this is unlikely to have the intended effects. This is because investments in local amenities are capitalised into house prices and rents, as richer households bid up prices in the area. More specifically, the following have been shown to measurably push up house prices or rents in the vicinity:

- access to local parks and green space [85]
- high quality local architecture [86]
- noise level reductions [87]
- the quality of local schools [88]
- light or heavy rail [89]
- Bus Rapid Transit [90]
- road improvements [91]
- flood risk infrastructure.[92, 93]

Evidence suggests those who want to live near good public infrastructure pay inflated housing costs. Low income renting households will either end up paying more for the right to live nearby through increased rents, or would be forced to move to a cheaper area. An important caveat is that this logic only applies to infrastructure in which proximity is necessary for use. Train stations are only useful if you live nearby, but power stations are useful even when far away.

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Spreading infrastructure investment more evenly

Infrastructure stretches beyond the hard engineering projects of rail and road, into the realm of cultural and environmental assets. It also spreads beyond the centre of the city. London is the greenest big city in Europe and the third greenest capital city in Europe. Many of its great public parks – Clissold, Richmond, Victoria, Greenwich, Battersea – lie beyond the city centre. The city is also criss-crossed by canals and waterways which are enjoying a renaissance as a place for leisure and exercise.

London also has a highly diverse population, with distinctive street scenes and public spaces spread along the High Roads radiating beyond the centre. Suzanne Hall has highlighted the importance of these seemingly ordinary public places in supporting the "everyday interactions... [which] are the primary conduits for sharing and learning, making and building".[94] Indeed the most recent Place Survey showed that parks and open spaces as the most frequently used public service.[95] The growing evidence showing the health and environmental benefits of access to green space adds to the case for ensuring all Londoners can access and enjoy green infrastructure.[96]

Despite the more even distribution of this sort of green space compared to some other types of infrastructure there are still significant differences in access depending on income. A 2010 CABE study found that "[t]he most affluent 20 per cent of wards have five times the amount of parks or general green space (excluding gardens) per person than the most deprived 10 per cent of wards".[97] The analysis also shows that three of the four boroughs that are least satisfied with their local green space are the relatively deprived outer boroughs of Hounslow, Harrow, and Waltham Forest. The challenge, is how to increase access to green and cultural public assets without also increasing housing costs in the area.[98]

There is a need to follow US examples where there are initiatives that focus[99] on ensuring that the worst served areas get greener, often through community led 'clean ups' and restorations of abandoned public spaces.

Investing in green or public spaces in the places which currently have the least access should limit any upward pressure on prices. This 'levelling up' approach also has the benefit of being targeted directly at those who are currently least included.

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Links between infrastructure and environment

Improving infrastructure in London sometimes creates difficult environmental trade-offs, however it also offers the opportunity for environmental improvements and for London to enhance its competitiveness by becoming a greener city. Infrastructure development has the ability to have direct and indirect effects upon the environment, and the ability to reduce risks from future climate change.

Historically, London's major infrastructure investment has come forward largely to relieve existing problems such as rail capacity (e.g. Crossrail) or to improve connectivity (e.g. the London Overground expansion). So whilst major infrastructure investment is not developed solely for environmental benefit, major environmental benefits can nevertheless be achieved through infrastructure development.

Although major infrastructure, such as new housing and transport schemes have sought to mitigate environmental impacts and provide some environmental enhancements, these come as almost secondary aspects to the development. There is a need for development to move away from the check list approach of providing minimum environmental mitigation to a system where the wider benefits of providing environmental enhancements are realised.

In terms of climate change, London has a real opportunity to deliver major low carbon programmes utilising the existing technological, research and financial mechanisms and institutions that already exist in the capital to support it. Development and investment in low carbon Infrastructure will help unlock this potential and allow London to be an innovation leader in carbon technologies, ahead of other capital cities across the world, promoting new jobs and growth. The GLA state that London's status as a cleaner, resource efficient and greener city will attract more businesses as its global reputation is enhanced.

In addition to large scale infrastructure, the contribution of smaller scale interventions should not be overlooked. The introduction of smaller scale interventions through the infrastructure development process can offer a simple and more cost effective way to develop environmental enhancements. A shift to lower energy and water consumption can be encouraged through introduction of water meters into homes, district cooling systems providing an alternative to air conditioning, the introduction of green roofs and walls to provide insulation and the encouragement of a shift from the private car by the introduction of cycle parking, cycleways and pedestrian routes.

To realise the maximum environmental benefits, and assist in future proofing London from environmental risks, environmental enhancements must be fully integrated into design at the earliest possible stages. Small scale interventions should not be overlooked and forthcoming infrastructure developments offer the ability to future proof against environmental and climate change risks. They should become a priority in forthcoming infrastructure development.

The value of London's low carbon and environment goods and service sector is estimated at £25.4bn to London's economy.[100]

100. kMatrix – London Low Carbon Market Snapshot (2013)

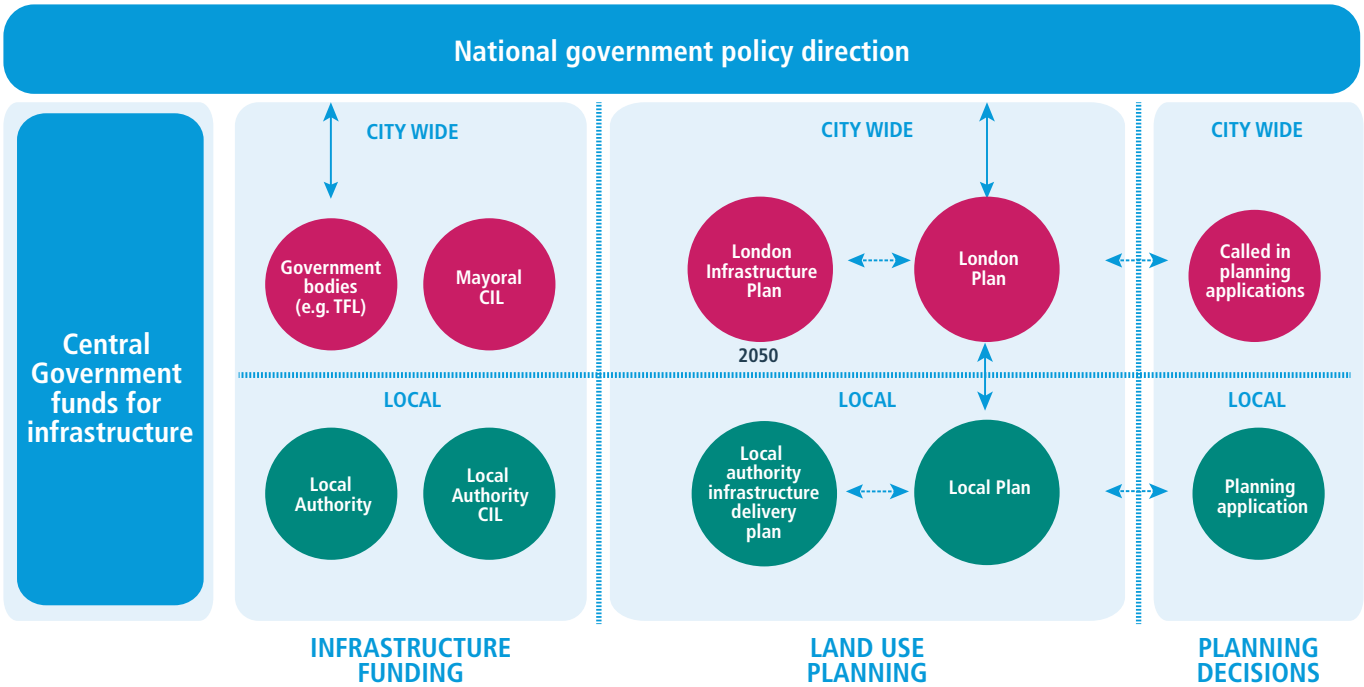
Current approaches to planning

If London is to deal with the risks to its competitive advantage the current approach to planning land use and infrastructure will need to be fit for purpose. The following considers the existing strategic and project level approaches in London and the issues that the approaches pose to deal with risks to London's competitive advantage.

London's approach to planning is multi-layered as can be seen from the diagram below. Land use planning is directed by the overarching National Planning Policy Framework, while infrastructure planning is subject to the over arching policy objectives of central government departments. The Mayor of London sets the strategic direction for land use planning through his London Plan, the spatial development strategy for London, and local authorities prepare their own local plans which must be in conformity with both the NPPF and the London Plan.

Planning decisions are made at the local level on the basis of the policies and development strategy set out in the local plan. The Mayor of London must be consulted on all planning applications of strategic importance to ensure they conform with the London Plan. The Mayor has the power to direct local authorities to refuse permission or to 'call in' strategic developments to make the decision.

The Mayor has prepared an infrastructure plan that sets out how he intends to support the development set out in the London Plan. At the local level local authorities prepare infrastructure plans setting out what infrastructure will be required to deliver the level of growth they are planning for. Funding for infrastructure comes from a range of sources, including central government funds, funds from public sector bodies such as Transport for London, local authorities and funds generated through developer contributions such as Community Infrastructure Levy (CIL).



Strategically planning London's infrastructure

Strategic planning in London is the shared responsibility of the Mayor of London, 32 London boroughs and the Corporation of the City of London. At the city level, the Mayor of London has produced two strategic plans for London: the London Plan and the London Infrastructure Plan 2050 that sets out a number of mainly infrastructure-led projects to meet the needs of London's growing population. At the local level, local authorities are responsible for producing strategic Local Plans that identify infrastructure projects to be delivered at a more localised level.

City planning

The London Plan adopted in March 2015 sets out an integrated economic, environmental, transport and social framework for the development of London up to 2036. The London Plan recognises the scale of London's housing crisis, identifying that over the period 2015 to 2025 that London has capacity for at least 420,000 additional homes or 42,000 per annum. However, London is already falling short of this, and is failing to address the full extent of its housing needs.

The London Plan recognises London's growing population will require more housing along with hard infrastructure (e.g. transport, energy, waste, water and digital network systems). It also recognises that London will need more social infrastructure (e.g. community facilities) and green infrastructure (e.g. parks and open spaces) to ensure a high and improving quality of life. The London Plan sets out planning policies to address London's housing supply shortage, along with proposals to deliver infrastructure and environmental improvements.

The delivery of new infrastructure in London is complex, resource-intensive and involves consensus across a range of stakeholders (e.g. the Mayor of London, local authorities, businesses, voluntary organisations, infrastructure providers and developers). The London Plan recognises that in at least the early part of the Plan period there is likely to be fewer funds available for infrastructure that is needed to support the growth identified. It is critical that existing resources and tools are utilised along with new financial mechanisms, so that London's much needed infrastructure can be delivered to maximum effect and benefit to all.

The London Plan considers that a joined-up approach to 'place shaping' is essential and in bringing forward new development; it is vital to consider issues around 'economic development, transport and other infrastructure and quality of life together'. However, whilst the London Plan recognises that many of the risks to London's competitive advantage exist and are interlinked, it is not ambitious enough to directly address them.

Issues:

- The London Plan does not go far enough to directly address the risks to London's competitive advantage (for example, identifying clear interventions in tackling London's housing crisis).
- The London Plan identifies there is likely to be a shortfall in bringing forward new infrastructure development within the early part of the plan period. However, it does little to address how this funding issue can be managed.
- The London Plan needs to consider the spatial distribution of long term growth in London and how infrastructure will help to deliver this growth.

The London Infrastructure Plan 2050

The London Infrastructure Plan (2050 Plan) acknowledges that the unprecedented rate of population growth in London will place increasing pressure on the Capital's physical and social infrastructure.

Between 2011 and 2050, overall population growth in London is projected at 3.1 million, or 37 per cent. This puts London's population at 11.27 million at 2050. Oxford Economics forecasts this to be 12 million by 2050. This could mean the estimated infrastructure requirements identified in the 2050 Plan (and the £1.3 trillion of investment to deliver it) is an underestimate of the true needs that London will face. Failure to properly plan for London's growth could undermine the city's competitiveness.

A full range of infrastructure will be required to meet the needs of London's growing population, which include utilities (e.g. clean water and energy along with flood defence, sewerage, drainage, reuse, recycling and waste disposal), green infrastructure, transport, information and communications technology and schools. The 2050 Plan is the first strategic attempt by the Mayor of London to set out London's infrastructure needs and to consider the costs and potential financing mechanisms for implementation.

It is important to consider how the £1 trillion of infrastructure investment can shape the type of growth that can address the risks and grow London's competitive advantage. To address this, the Mayor of London has created an Infrastructure Delivery Board formed of diverse professionals including infrastructure providers, regulators, engineers, developers and advisors at all levels of government.

Even with the Infrastructure Delivery Board, collaboration and delivery of the infrastructure plans is unlikely to be straightforward. Agreement will need to be reached on funding mechanisms, and current policy is disjointed in terms of timeframes. For example, the 2050 Plan has a much longer term ambition than the FALP which has a plan end-date of 2036. Delivery of 2050 Plan will therefore be subject to changes in London's mayoral leadership, which may result in changing priorities for the implementation of the 2050 Plan.

Issues:

- The 2050 Plan considers a range of spatial options for growth, but it could be improved upon by committing to a preferred growth scenario.
- The 2050 Plan rightly makes some ambitious plans for infrastructure provision. However, consideration should be given to whether investment in a greater number of smaller scale interventions could achieve wider benefits.
- The 2050 Plan makes a good job of defining what the likely infrastructure needs for London will be, but it could be improved by considering the full range and importance of social infrastructure (e.g. health services, schools, care homes, children's play, community halls and cultural facilities). A detailed analysis needs to be undertaken to understand London's social infrastructure requirements and how the delivery of social infrastructure could be better aligned with the delivery of 'hard infrastructure'.
- The 2050 Plan could be improved by considering the negative consequences associated with London's growth e.g. displacement of residents and businesses as land values rise, lengthening of commuting trips as Inner London jobs rise and the population moves further out, the worsening of quality of life for the majority of Londoners and the inevitable degradation in the quality of the environment (e.g. worsening air pollution).
- A clear and realistic prioritisation of infrastructure projects based on robust criteria that considers the clear economic, social and environmental benefits, that could then be developed into an infrastructure investment programme would strengthen the 2050 Plan.
- The focus on public transport improvements (such as rail and road capacity) could be strengthened through further consideration of bus and cycle networks (which can better connect outer London and are important to people on lower incomes).

Local planning

London's local authorities produce strategic Local Plans to consider how they can provide the homes, jobs, facilities and infrastructure needed to support the growth in the number of people living, working in, and visiting their borough.

Local authorities also produce infrastructure delivery plans, which include the potential financial and policy mechanisms to deliver them over their Local Plan period. Types of infrastructure included in the infrastructure delivery plans include educational, health, and sport and leisure facilities; emergency services; strategic transport; utilities and physical infrastructure; and green infrastructure.

Issues:

- Definition of 'infrastructure' differs between the city and local level. In general, the regional level definition of infrastructure is more restrictive and does not adequately consider the full-range and importance of social infrastructure.
- Infrastructure planning at the local level is more focused on addressing 'capacity' issues that falls short of tackling the key risks associated with growth (e.g. maintaining economic and social diversity).

Funding infrastructure

Funding for new infrastructure projects in London comes from a variety of sources (e.g. national government, private developers). A financial mechanism for funding infrastructure projects is the Community Infrastructure Levy (CIL), which is a charge enabling the Mayor of London and local authorities to collect funds from new developments in their area. Once the CIL has been collected, it will be used to fund infrastructure such as roads and other transport facilities, flood defences, schools and other educational facilities, medical facilities, sporting / recreational facilities and open spaces. The Mayoral CIL has been used to fund Crossrail, whilst the local authority CIL is used to fund priority infrastructure projects within the local authority area. There are also various ways of funding new infrastructure beyond CIL (as identified in the London Infrastructure Plan 2050), including pressing for new revenue-raising powers or exploring approaches like tax increment financing.

Issues:

- The investment in infrastructure (particularly transport) in London increases land values. Greater consideration should be given to how the uplift in property values can be captured for the public benefit and provision of new public infrastructure.
- Better linkages required in relation to prioritisation and funding of infrastructure projects at the city and local level.

Project level - Appraisal of infrastructure projects

All centrally funded public spending proposals are required to use Her Majesty's Treasury (HMT) Green Book approach (The Five Case Model), to develop a business case supporting investment funding decisions for new policy, strategy, programmes or projects (interventions). The business case must show:

- there is a compelling case for change (strategic case) - shows strategic fit and predicated on robust and evidence based case for change
- intervention represents best public value (economic case) - purpose is to show spending optimises public value
- proposed deal is attractive to the market (commercial case) - includes planning and management of the procurement
- proposed spend is affordable (financial case) - shows that preferred option will result in a fundable and affordable deal and
- what is required from all parties is achievable (management case) - shows the preferred option can be delivered successfully.

Each intervention is assessed to see how it fits with national, regional and local policies. The strategic case will be based on assessment of the issues (business needs) associated with the status quo (existing arrangements), and the potential scope of the proposed spend in relation to the anticipated benefits and risks.

The business case is used to appraise a long list of options, in terms of how well they meet spending objectives and then subject a short list of options to cost benefit analysis (CBA). CBA quantifies in monetary terms as many of the costs and benefits to the UK as possible for the shortlisted options.

DfT and TfL have pioneered guidance that assesses a wide range of economic and other benefits, that has become standard practice when assessing infrastructure projects.

Department for Transport – Web-based Transport Analysis Guidance (WebTAG)

There is detailed guidance available for appraising transport interventions, this includes WebTAG for Department for Transport funded projects and in London Business Case Development Manual for Transport for London funded projects both of which follow the Green Book principles.

Transport projects or studies that require government approval are expected to make use of TAG, for those that do not require government approval, TAG should serve as best practice guidance.

The appraisals process assists options generation, development and evaluation of intervention impacts.

TAG does not just consider direct impacts of the intervention on transport users and service providers, it considers impacts on environment, wider society and government. It places a monetary value on as many impacts as possible to allow direct comparison between costs and benefits of intervention.

The key impacts on economy, environment, wider society and government include:

Economic impacts

- Business users and transport providers
- Reliability impacts on business users
- Regeneration
- Wider impacts – impact on wider economy e.g. agglomeration

Social impacts

- Commuting and other users
- Commuting reliability
- Physical activity
- Journey quality
- Accidents
- Security
- Accessibility
- Affordability
- Severance

Environmental impacts

- Noise
- Air quality
- Greenhouse gases
- Landscape
- Townscape
- Historic environment
- Biodiversity
- Water environment

Government impacts

- Cost to transport budget
- Indirect tax revenues

Transport for London – Business Case Development Manual

The TfL business case guidance follows the Green Book principles set out in other guidance. The TfL approach identifies a base case where the effects of doing a transport project are compared against not doing it. The approach is used to generate options, identify costs and benefits, quantify benefits and dis-benefits (social benefits, ambience, pollution, health benefits, accessibility and safety), and quantify wider benefits (regeneration and social inclusion).

The TfL guidance advises that Strategic Assessment Framework (SAF) or other multi-criteria tools can be used to specify the contribution the project will make to the Mayor's Transport strategy.

Issues:

- Putting a price on some benefits (e.g. environmental benefits) can often be difficult and so a CBA may not be able to fully take account of these.
- CBA measures the net benefits overall, but does not factor in particularly well the costs that might be paid by one group while other groups benefit. This could be a particular problem where social equity is an issue.
- CBA is constrained by the range of options tested. This can make it difficult for CBA to overcome bias that might be inherent in the commissioning organisation, meaning that alternatives offering wider benefits are not being considered.
- CBA relies on interpretation of data, so although transparency is a stated aim of the guidance, they can become too technical and difficult for a wide range of stakeholders to engage with.

Chapter summary

- London's capacity to act in managing the risks to its competitive advantage is based on governance, planning, finance and delivery and economy.
- Planning of infrastructure and land use offers a great opportunity to deal with the risks to competitive advantage as there are clear links between infrastructure and unlocking housing delivery, creating a diverse economy, creating an inclusive city and creating an attractive environment.
- The current approaches to planning do not go far enough in dealing with the risks to London's competitive advantage. There is a need for closer integration and alignment between the London Plan and the London Infrastructure Plan 2050.
- The London Infrastructure Plan 2050 does not fully consider social infrastructure which will be important for dealing with the risk of London becoming less equal.
- The London Infrastructure Plan 2050 needs to provide a clearer set of infrastructure priorities based on a set of criteria that seeks to meet the housing, economic, social and environmental risks that London faces.
- There is a need for better coordination of infrastructure planning at the local level to ensure that the strategic needs of London are met rather than focusing on local capacity issues.
- Infrastructure investment leads to an uplift in land and property values, there needs to be more consideration of how that uplift in value can be captured for public benefit.
- At the project level, there is a need to consider how the wider benefits of infrastructure provision can be better reflected in the prioritisation and commissioning of infrastructure projects and in developing business cases for those projects.

06

POTENTIAL SOLUTIONS

CENTRE FOR LONDON

OXFORD ECONOMICS

Safeguarding London's future

London's competitive advantage is at risk from the key issues of housing, the economy, society, and the environment. There is a range of ways these risks can be addressed. We focus here on planning, because this is a key area over which London has most control, and because planning helps to deliver much needed housing, jobs and environmental stewardship, which in turn are key to the city's success in terms of liveability, prosperity and resilience.

Successfully dealing with the risks we've identified can help London retain its competitive advantage and be prosperous, inclusive, greener and more resilient.

Scenario 2.
London 2050 an alternative vision.

London has made some bold decisions to help tackle housing undersupply. This includes use of the Green Belt to deliver housing, making use of infrastructure to unlock development potential particularly in outer London. This is helping to provide much needed homes across all sections of society. The focus of economic activity has spread from established centres. Outer London has been comprehensively revitalised through a programme that includes investment in orbital transport improvements (public transport and cycling), densification of suburbs and a redefined economic and social role for outer London centres. The focus on revitalising outer London has helped to tackle issues of inequality, by providing employment opportunities for a mix of Londoners.

Outer London is the place to kick start new high tech industries such as micro-manufacturing and allows greater flexibility in the repurposing of outdated office and retail accommodation to reinvigorate centres and allow them to adapt to new working and shopping patterns. There will be housing for all and outer London will also have improved parks, museums and theatres. Improvements to low cost transport will have been implemented allowing better access to cultural assets in central London. Infrastructure prioritisation will be focused on those people that are in most need.

London's major Opportunity Areas have been developed in a more responsive way that meet the needs of a changing economy and has boosted London's resilience to risks. This is a London based on Curated Clusters, designed to be more flexible and adaptable to the future economy and environment. Curating makes use of the latest technology to continually manage the life and needs of the cluster. It is a London that supports a diverse society and economy. Comprehensive networks of green infrastructure and public realm and a car-free environment have helped to create a high quality of life which is key to the city's success.

London is better adapted to the risks of climate change, helping to minimise damage to homes, businesses and critical infrastructure. The city has taken major steps to improve air quality, which has had benefits in improving health and quality of life.

What does this mean for London's competitiveness?

London becomes more socially equitable and remains a stable place attractive for talented individuals to live and work.

London enables a wide range of sectors to thrive including emerging growth sectors meaning the economy is diverse and resilient.

Housing availability and affordability issues are tackled through more efficient use of land allowing London to continue to accommodate those that want to live and work in the city.

The city is more adaptable to the changing global economy and is continually curated to retain London's competitive edge.

Development has focused on achieving a high quality of life by being green, car free, and more people oriented. This makes London attractive to investors and workers.

A more considered infrastructure investment programme based on a need to deal with the risks London faces means investment in infrastructure is based on projects offering the greatest benefit.

How can we get there?

We propose some bold new approaches to planning and infrastructure which can help to safeguard London's competitive advantage and help London on a path to a better future. These proposals relate to specific places currently earmarked for significant new development and they relate to land use planning across the city and at London's boundaries.

A major strategic **programme to revitalise** outer London

Prioritising **infrastructure investments** to be more inclusive
A strategic approach to **green infrastructure**
How can we get there?
Opportunity Areas reimagined as **'Curated Clusters'**

PROPOSAL 1

Prioritising infrastructure investments to be more inclusive

Risks tackled

Housing – unlock housing potential through infrastructure delivery.

Economy – infrastructure provision focused on assisting London and the wider region's economy and is more responsive to changing economic circumstances.

People – more socially equitable approach to infrastructure delivery.

Environment – a more environmentally sensitive approach to infrastructure delivery.

As London grows, social inequality is growing. There is a need to acknowledge this will damage London's competitiveness. If this trajectory is to be reversed, the city needs to be planned for the benefit of all Londoners.

London-wide infrastructure investments have to a large extent focused on big infrastructure projects that help to reinforce the existing spatial structure of London (for example investment in radial transport routes). Future infrastructure investment will need to ensure there is prioritisation in investments that seeks to address the issues outer London is facing, as such London's infrastructure planning programme should build in the revitalisation of outer London as a key priority.

Infrastructure investment needs to be targeted directly at those who are currently least well served. Local authorities and other public bodies should develop prioritisation tools to channel infrastructure funding to the most deprived areas and where they would have the most impact. Better prioritisation of infrastructure investments and a more clearly defined schedule and programme for infrastructure spending at the local authority level would also help to reduce the amount of funds collected through CIL that go unspent as the money has not been allocated to a project.

CASE STUDY: Gillett Square

Gillett Square has been converted from a car park into a public square by a Private-Voluntary-Public (PVP) partnership consisting of the former Mayor of London's Architecture and Urbanism Unit, Gillett Square Partnership, the London Borough of Hackney, the Department for Communities and Local Government, Groundwork East London and Hackney Co-operative Developments. Three social enterprises manage the square along with the London Borough Hackney.

Crucially, the redesign includes performance and retail space preserved for a range of interests including local art groups, local creative industries, ethnic food retailers, tailors, an electronics repair shop and local radio station.

Regeneration experts describe the value of such partnership-led regeneration in enabling "a better balance [to be] struck between the needs of poorer local communities and more affluent newcomers to the area".

Gillett Square

Source: Hawkins\Brown, Photographer: Cristobal Palma

The London Infrastructure Plan 2050 is London's first attempt at coordinating the planning and delivery of infrastructure across the city. It does provide a useful tool in quantifying the type and scale of infrastructure that will be needed in London and how much this will cost. However infrastructure planning in London could be improved to ensure it deals with the risks to London's competitiveness that we've identified.

Change the way infrastructure projects are appraised

Infrastructure projects are currently assessed through cost benefit analysis (CBA) where putting a price on some benefits (for example some environmental and social benefits) can often be difficult and so CBA does not fully take account of these issues. CBA measures the net benefits overall, but does not factor in particularly well the costs that might be paid by one group while other groups benefit. This could be a particular problem where social equity is an issue. CBA may also be constrained by the range of options that are tested. This can make it difficult to develop or consider alternative infrastructure options that could have a wider range of benefits.

Given these difficulties it is crucial that organisations that are commissioning projects are fully aware of the risks London faces and the potential infrastructure has in helping to address these risks (for example the increased growth potential that transport infrastructure investments can unlock), and the wider risk that London's competitive advantage is at risk. This consideration should be incorporated into the investment funding objectives of these organisations, so that when they get to the point of developing particular projects they have these issues in mind. This would help to generate some realistic alternative infrastructure options with a more social and environmental focus and would help to ensure that the strategic case for the project would ensure a better social and environmental outcome.

CASE STUDY: Unlocking major development of Barking Riverside through transport investment

Over the next five years around one third of all new homes in London will be located in four East London boroughs of Newham, Tower Hamlets, Greenwich and Barking & Dagenham.[101]

It is clear that transport improvements (such as extension to the London Overground) will be important for unlocking housing development within these boroughs. Transport improvements such as the East London [Overground] Line have been key in driving demand in previously overlooked areas of London.[102]

The largest housing development site in East London is the Barking Riverside that covers around 180 hectares. It is part of the London Riverside Opportunity Area and has planning permission for up to 10,800 new, mixed-tenure homes to accommodate 26,000 people, together with healthcare, shopping, community and leisure facilities and environmental benefits, new public transport links and employment opportunities.

However, the Barking Riverside area has relatively low public transport accessibility. To enable the development of the scheme, Transport for London is considering an extension of the London Overground Gospel Oak to Barking service, from its current terminus at Barking to a new station in the heart of Barking Riverside. This transport improvement has been backed by the Government, which announced that it would provide a loan of £55 million to support the delivery of the Overground extension to Barking Riverside.[103] It is clear that the Overground extension would unlock the potential of the Barking Riverside area and support the creation of thousands of new homes that will contribute to meeting London's future housing needs.

Unlocking Barking Riverside Development Scheme

Source: Barking Riverside Consultation Report (Jan 2015)

101. Savills (2014) London Development: building opportunities East of City

102. Savills (2014) London Development: building opportunities East of City

103. UK Government (2014) Autumn Statement

Incorporate an ecosystem services valuation approach

Ecosystem services are the benefits that people obtain from the natural environment. Environmental valuation techniques allow us to express the value that the environment offers us in monetary terms. By integrating these techniques into our infrastructure and development planning we can ensure we do not under invest or over exploit our environment, and we can capture the benefits of investing in the environment. This in turn will help to address the environmental risks we have identified.

Key ecosystem services

Water quality & resources | Nutrient cycling & soil formation | Pollination | Aesthetic & recreation | Carbon storage | Flood control

CASE STUDY: London 2012

Atkins was the river-edge engineer used for the London 2012 Olympics and Paralympics. Wetlands were created along the River Lee that flows through the Olympic Park. Atkins utilised an ecosystem approach to help design and build a river-edge wetland that could maximise ecosystem service benefits, from wild species diversity to recreation and amenity, within a constrained urban area.

Source: Atkins

Coordination of planning with wider region

London's influence stretches over a much wider area than its existing administrative boundaries, as seen through the increasing distance people are commuting and the movement of people out of London to find an affordable home. Planning places a duty to cooperate on local authorities on strategic matters, such as housing. However, if London is to meet its housing delivery and affordability risks as well as helping the wider functional economy to operate properly there needs to be a more bold and coordinated approach to planning across the boundaries between London and its surrounding areas.

A more coordinated response to planning over a wider area would also have the benefit of helping to tackle some of the environmental and economic and people risks that London is facing. For example air quality in London is affected by car based travel within London but also by movements into the city from outside, and a collaborative approach to tackling the problem would have more impact than if London acts alone.

Data enabled engineering and planning

New methods of data collection should be harnessed to improve the way London plans its land use and infrastructure provision. Reality mining using various sources such as 'big data' from fixed sensors, mobile phone data, social media and crowd sourced data would enable London to respond quickly to existing and emerging trends in patterns of movement, socio-economic trends and demographics to model the future more accurately.

Data enabled planning which is more responsive can be used for many applications as well as improving the ability to anticipate change and forecast future community needs and services more effectively. There are numerous applications of mobile data for city planning and infrastructure planning that would provide benefits to quality of life, the environment, and society such as better open space planning and school place planning, to assist in decisions about co-location of public services, to making improvements to how transport services run or making a decision about how transport investments could be targeted.

CASE STUDY: Waterloo journey analysis

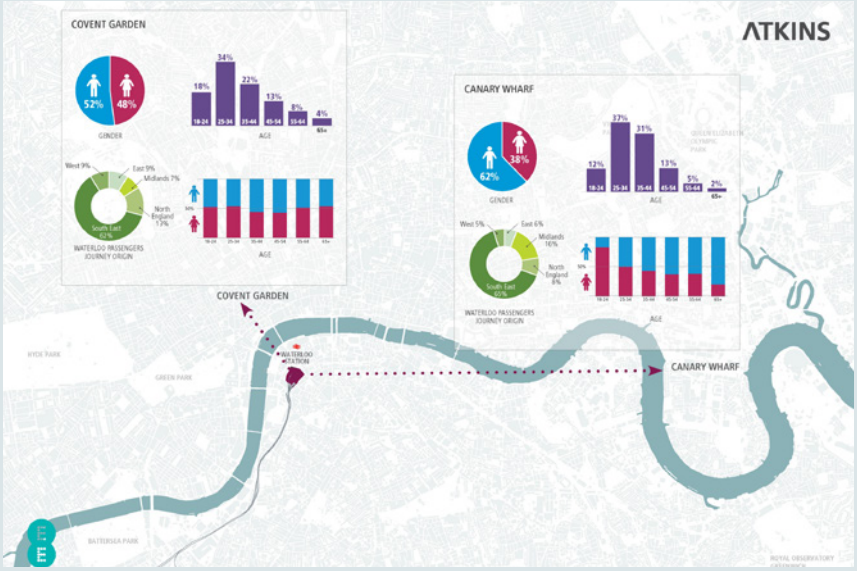
Atkins has formed a partnership with EE, the UK's largest mobile phone network, to create mobile data-enabled products and services that generate unique insights from big data that has the potential to transform how the UK grows and improves its infrastructure and puts the needs of customers at the heart of the infrastructure decision making.

A better understanding of risk and opportunity is important for local authorities, private investors, business and communities – all of whom seek to ensure that investments are used to leverage the widest benefits.

Combining mobile data with other datasets, Atkins and EE are creating insights from an objective evidence base that reveal the impact of investments on people and places. This approach to evidence based commissioning can identify areas where services can be improved and target infrastructure investments to those people and areas that need it most and where the benefits are greatest. The richer understanding of behaviour and demand can contribute the design process and improve the quality of services and places, overcoming the limitations of traditional survey techniques, for example through its timeliness and sample sizes. Atkins and EE have also developed predictive solutions that evaluate the impact of a service or intervention, so investment risks become more transparent and can be reduced for all parties leading to more cost effective and sustainable outcomes. This example of using big data to help cities is about making better decisions and assessing the impact of investments.

London Waterloo Station

The maps and illustrations below show the kind of insight mobile data can provide around how people are using the infrastructure in our cities. They capture onward journeys from London Waterloo Station, showing where people have travelled from, which underground routes they take and the demographic profile of these people, over a 24hr weekday period. This provides valuable insight for improving the design and access of train stations to meet society's changing needs, and it can support optimisation of operational performance leading to a safer environment and better customer experience.



Source: Atkins

Delivery - issues to consider

- Coordinated working amongst stakeholders (GLA, boroughs, Government departments etc.) is required to align investment priorities.
- The proposed review of London Plan should include aligning the London Infrastructure Plan 2050 with the spatial strategy for London.
- TfL should work with HMT, DfT and others to look at potential amendments to the CBA appraisal framework.
- Recognising the influence of London and its relationship to its wider metropolitan region, there is a need for a mechanism for improved cross boundary working. A formal partnership between London and local authorities outside of the capital is required so that planning of infrastructure, housing and employment needs can be coordinated.
- GLA, boroughs and infrastructure providers to consider how they can incorporate new techniques of data use into their infrastructure planning. Best practice guidance should be developed to assist with this.

PROPOSAL 2

A major strategic programme to revitalise outer London

Risks tackled

Housing – housing supply and affordability addressed through outer London's potential being realised.

Economy – London's economic imbalance is tackled by redefining outer London's role.

People – outer London is revitalised to provides more jobs and social opportunities for the suburban poor.

Environment – environmental quality is improved by promotion of sustainable modes of transport.

Inequality in London will continue to grow if the imbalance between inner and outer London in the type and number of jobs continues and the lack of affordable housing continues to push people to outer London and beyond. The lack of jobs in outer London mean that people must commute into inner London for employment opportunities. This places additional pressure on London's transport infrastructure. Rebalancing London's growth will require a number of bold interventions aimed at defining a new role for places in outer London:

Create connectivity for all within outer London – New orbital rail links are essential if outer London's potential is to be unlocked because traveling between places in outer London is currently very difficult. This could be through upgrades to existing linkages, and new dedicated links, where both the development potential and potential passenger numbers would allow. But investment in rail will not be enough. Smaller interventions have a role to play. There needs to be new cycle infrastructure that can help to interconnect outer London. At present all the existing and planned cycle super highways are radial - investment in orbital cycle super highways is also required. The cycle hire scheme, currently focused on central London, should be extended to outer London. Other options include provision of 'cycle hubs' that allow people to park their bike in a secure facility next to stations and can incorporate a privately operated bike maintenance shops which generates some rent to help cover costs, along with the small fees charged to those that park their bikes there. In order to be commercially sustainable cycle hubs need to be built near busy stations, on land owned by the station operators. They could be developed next to outer London Crossrail (or Crossrail 2 or orbital rail stations), which have a very high daily capacity but are generally situated in low-density areas.

Densify suburbs – There is also scope to densify outer London suburbs. This would require considerable public sector involvement including compulsory purchase mechanisms, with the purpose of redefining our suburbs in order to deliver more housing. It will be important that this is achieved in a way that promotes high quality design and retains the unique character and heritage of these areas. These areas will need to be redeveloped to provide a mix of housing types and tenures to ensure that they provide a mixed community. Suburban densification would need to be supported by appropriate social infrastructure and green space, and would also benefit from improvements to the existing transport network (such as 'metro-isation'[104] of suburban rail lines) and new orbital rail links which would help to link up outer London's centres and suburbs.

Repurpose office stock – Outer London town centres contain a stock of increasingly under-used traditional office space. This is not only an under-used resource, it is also exacerbating decline in these areas. There should be a programme of repurposing offices to become flexible workspace, for example more 'rent a desk' space with 'wellbeing' and communal facilities (medical and fitness centres, yoga rooms, cafés, juice bars etc.) to provide a mix of residential, employment other uses that can revitalise office space into 'mini villages'. This type of accommodation will appeal to the needs of the sectors that are anticipated to grow in outer London including the professional services, IT, arts and entertainment sectors.

Help outer London to become the micro-manufacturing excellence hub – Although traditional manufacturing is in decline and is forecast to decline in outer London, a number of trends in agile manufacturing and rapid prototyping such as the growth in 3D printing could lead to a rebirth of 'manufacturing'. This will lead to a demand for new types of hybrid business premises, where designers can work close to those 'making' products or components through 3D print machines and linked to a distribution centre that coordinates delivery of goods to market 'just in time'. Outer London would be a good place to locate these micro-manufacturing hubs to take advantage of cheaper accommodation and the availability of a ready supply of labour.

104. TfL assuming control of suburban railway lines and upgrading the stations and rolling stock and increasing the frequency of services.

Repurpose outdated retail spaces – outer London also suffers the declining demand for retail floor space as the trend towards online shopping increases. These spaces should be repurposed to leisure and convenience shopping and the surplus used to create the much needed cultural resources that is lacking in outer London, as well as residential accommodation. A locally distinctive retail offer should also be encouraged by promoting small scale and affordable retail space and allowing for temporary uses of space.

Plan and manage outer London in 'real time' – a rapid response planning system is needed to enable outer London to become an adaptable and resilient place. This means using new technology, up to date data and a flexible approach to respond to market trends to allow 'pop-up' employment generating uses to quickly take advantage of floor space. A live data stream on floor space utilisation and employment levels would support planners and their decisions on change of use applications and would be a tool for matching people looking for space with premises.

Improve access to the 'common wealth' of London – It is clear that many people in London are finding it increasingly difficult to access London's common wealth – these are the cultural resources, events and open spaces that are essential to quality of life and inclusion of all Londoners. This common wealth is one of the unique qualities of London as a world city, but is concentrated in central London. Bus network improvements to enable those on lower incomes to access London's common wealth would help to improve the quality of life of the suburban poorer (bus using) Londoners as well as providing them with a cheaper option to access job opportunities. It may be necessary to rethink the way routes are planned. There is also a need to develop a better cultural offer in outer London centres. This would help to provide jobs as well as improving the attraction of outer London as a place to live.

Delivery - issues to consider

- A partnership and/or a delivery vehicle will need to be established for outer borough town centres or across a group of centres.
- There is a need to consider land ownership and how land owners can come together to deliver revitalisation (with public sector assistance) in outer London. There will also be a need to make better use of existing public sector land assets.
- Detailed planning frameworks will need to be in place to set out a strategic approach to the revitalisation of outer London. This would need to consider the mix of uses, and how to retain and improve the distinct character of each centre.
- Funding for new infrastructure to support the programme will be important. This is an issue for London as whole. As devolution of funding to cities including London gathers momentum it will be important to consider how outer London can ensure that it receives a fair share of funding to support outer London growth.
- Develop a growth sector support service, with a particular focus on SMEs in the outer boroughs.

CASE STUDY: Regeneration of Croydon

Croydon is a London Plan Opportunity Area with significant capacity for new housing, commercial and other development. The Croydon Opportunity Area envisages the construction of 10,000 new homes with the creation of 7,500 jobs and improvements to key parts of the local transport infrastructure, including East Croydon station. The town centre is a strategic office location but there is a need to modernise the office provision and encourage the conversion of surplus capacity to other uses including housing. This will help to realise Croydon's aim to be a place of enterprise, offering businesses a strategic base and focus for growth.

With a £23million support package from The Mayor of London's Regeneration Fund and £70million already committed by Croydon Council and other partners the town centre is beginning its transformation. Public investment has already helped to attract and secure the £1.5billion of private investment from the Croydon Partnership (Westfield/Hammerson) which over the next few years will transform Croydon's two main shopping centres Whitgift and Centrale into a retail and leisure destination. The scheme will also comprise cinemas, a bowling alley and up to 600 new homes. It is expected that it will create more than 5,000 permanent jobs, many of which would be for local people.

Following the riots of 2011, Croydon Council has been working with the Mayor of London and other partners to revitalise the town centre. Through the connected Croydon programme the town centre is being transformed into a more attractive environment in which to live and work, socialise and do business. A package of improvements across the town centre includes:

- Improved access to stations and tram stops
- Upgrading the quality of shop fronts
- New cycle parking
- Public realm improvements including pedestrian improvements, lighting, signage and seating.

PROPOSAL 3 Opportunity Areas reimagined as 'Curated Clusters'

Risks tackled

Housing – housing supply and affordability tackled through opportunity area potential.

Economy – London's economic diversity maintained by providing for key growth sectors.

People – new neighbourhoods created that places emphasis on mixed communities with opportunities for all.

Environment – environmental quality is improved by promotion of sustainable modes of transport and green infrastructure provision.

Throughout history, as with all world cities, significant programmes of development or redevelopment have taken place on strategic parcels of land, and London is no exception. The current such 'Opportunity Areas' are all crucial to the delivery of a high proportion of London's future housing and jobs. However, it is essential to learn the lessons of previous 'mega projects'. New regeneration must avoid perpetuating the risks to London that we have identified. As well as accommodating housing and jobs growth they must be viewed as opportunities to help boost London's economic and social resilience.

Some previous mega-projects have proved to be inflexible to changing economic and technological circumstances. Whole districts were designed for the specific needs of a single industry or purpose. In the case of Canary Wharf, it was the financial sector. Yet our forecasts show that London's growth sectors are the creative and technology industries and other business services, which need very different types of space and floorplans. When combined with technological changes in the financial sector, it seems the occupancy of such sector specific workspaces could decline substantially.

A more futureproof solution to London's strategic land development could be Curated Clusters - urban places of distinctive character and high quality of life, containing a flexible and adaptable mix of residential, commercial, retail and services, maximising the appeal to a variety of industry sectors as they emerge and evolve.

Curated clusters are a form of active place making and management which goes beyond traditional planning and design or property management. The approach seeks to maximise opportunities for economic and community development. Key principles include:

- Accessibility enhanced to match the scale and intensity of activity through additional connections prioritising non-motorised modes and public transport.
- Addressing market failure in the commercial property sector and providing a model of regeneration to enable provision of a diverse range of business premises types supporting a mix of businesses and the cultivation of new economic sectors and business activity.
- Delivery of homes to complement and sustain the cluster and reflecting local housing needs.
- Provision of accessible local services and leisure options in line with the scale and profile of communities and the level of need in the wider catchment area.
- Using the development as a social catalyst and basis to address the needs of the wider community beyond the opportunity area to enable an inclusive approach. Provision of open space and built community spaces and programming to provide for cultural and sporting activity, community needs and business networking.
- Design of places to provide for activity/ vibrancy and amenity.
- A high level of environmental ambition including opportunities to support green growth and the circular economy.
- A business and funding model and management approach to curate and sustain successful places.

The components which would be provided for within curated clusters include:

Adaptable business space – the traditional formal office building will not be the dominant norm in the future. The future lies in urban 'mini-villages' where people work, eat, meet colleagues and friends, shop and access services and leisure. Collaborative spaces which are adaptable and programmed to support a range of activity over the day and week will attract and cater for creative industries and provide an environment where interaction and spontaneous exchange of ideas can emerge. Start-up businesses could be nurtured and grow in premises which would be let on short term and flexible terms. Blended work/life culture and creativity would flourish.

Affordable business space – small and medium enterprises (SMEs) can be encouraged by developing planning policy that requires the provision of a range of affordable business space within commercial developments. This could operate in a similar way to affordable housing policy in that a proportion of the commercial space would need to be provided at an affordable rent and on flexible terms. Affordable and flexible business spaces are particularly important to the creative and knowledge industries who are often unable to commit to long term leases due to the uncertainty around how successful products or services they are developing may be.

CASE STUDY: East London's creative clusters

East London's 'Tech City' is the area encompassing Shoreditch, Hoxton and particularly Old Street and is a thriving major hub for media agencies and high tech and digital firms. Initially a cluster that grew organically, the area has gained momentum since the Government launched the 'East London Tech City' initiative in November 2011, with the intention of accelerating the growth of the emerging Silicon Roundabout digital clusters in East London. The area has rapidly grown and has attracted over 3,280 companies including start-ups and multinationals.[105]

The rapid growth of Tech City achieved by the critical mass of cultural, media, marketing and internet industries is rippling out into the wider east London area. It is estimated that within the wider area encompassing the east London postcode of EC1V, 32,000 new businesses have been created in the area between 2012 and 2014.[106]

This success has not been without its price as the rents have increased substantially, meaning that start-ups that value cheap and flexible rental arrangements have been forced to look elsewhere for business space.

Hackney Wick and Fish Island (HWFI) located to the east of the Queen Elizabeth Olympic Park is another of London's creative clusters with over 600 studio spaces available, this is an area with a thriving arts community. The arts community co-exists alongside printers, building suppliers and other light industries and a mix of other uses such as gallery space and bars. HWFI is now beginning to change with up to 4,500 new homes planned in the next 15 years, the area is seeing similar issues as Shoreditch regarding rental increases as investors are moving into the area off the back of the Olympics. HWFI has the potential to accommodate new homes and businesses, but there are concerns that the creative industries will be pushed out of the area. Two current development proposals at Swan Wharf (currently an artistic and cultural centre is due to be converted to flats and workspace), and Wallis Road Studios (currently providing space for 100 artists due to be converted to flats and workspaces) raise concerns that the new space provided as part of the redevelopment will be unaffordable to existing artists and businesses.

East London's clusters highlight how an affordable business space requirement is crucial to help nurture creative industries. Where new development comes forward, it is important that business spaces that are developed are in line with what the creative industry needs, including flexible space required to scale up quickly if successful or in a development phase.

Source: Atkins

105.Tech Nation (2015), Powering the Digital Economy, Tech City.

106.The Flat White Economy (2015), Douglas McWilliams

Mix of employment opportunities – resilient places will provide a diverse mix of employment opportunities, so that a wide cross section of Londoners can be employed rather than just highly skilled workers. There will be a continuing need for light industrial workshops to allow space for those industries that provide a vital support and servicing role to London's central business district (such as printers, food and drink processing and packing etc.). New typologies of business space in the curated clusters would provide space for these industries and provide job opportunities for a mix of Londoners.

Place making – curated clusters provide an opportunity to redevelop areas in London with new homes and jobs, but it is crucial that these areas create a sense of place. Retaining existing heritage and culture is important to this. Urban form is also important with the street being the key organising principle, allowing for a variety of building styles and scales to be developed. Density of development will be a key determinant of the type of place curated, and although achieving an efficient use of land will necessitate building at high density, this does not require a purely tall building response. Imaginative use of a mix of building sizes and types with an emphasis on mid-rise blocks will be important.

Mixed communities – there is a need to create places for all rather than a narrow section of society. This will mean delivering houses of different types that appeal to families, couples, single people and the elderly. A range of housing tenures will allow a mix of socio-economic groups to live together in the area. By following these principles a new community can be built to last, rather than creating a transient community that might stay for a short period of time.

CASE STUDY: New mixed use typologies

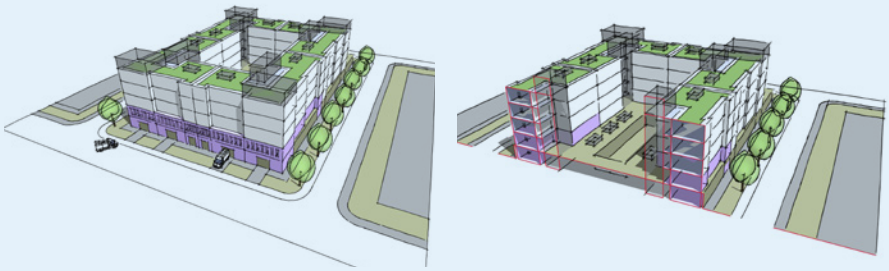
Key to maximising the delivery of homes whilst providing for a mix of employment opportunities will be the development of new mixed use typologies that allow residential and light industrial use to co-exist. Traditionally light industrial uses have been located away from residential use in employment areas. Most of these light industrial uses are day time uses that are clean and on the whole are compatible with residential use. Mixed residential and light industrial blocks are common in other European cities where artisans and other light manufacturing uses occupy ground floor premises whilst the upper floors of buildings are used as apartments.

A modern interpretation of this building typology is required for London (see illustrations). In this typology flexible light industrial units at ground floor allow for small scale clean businesses to operate. The simplicity and flexibility of the typology allows for any scale and type of business to be located here. Whether a small manufacturer or retailer, storage or office use, as one single open plan storey or spread across a double height with mezzanine. The space is both physically and functionally attractive and can be tailored to fit a great number of purposes and needs.

This typology could help to unlock employment areas for residential use, whilst re-providing employment premises. This will enable London's Opportunity Areas to provide for London's housing and job needs.

Furthermore, this typology will deliver a greater number of units and businesses per hectare compared to traditional mono-uses, which in return will generate a greater level of tax revenue to the local authorities.

Ultimately, this typology will be more advantageous in many ways:- economically, it will both provide more job opportunities and locally increased tax revenues, it will reduce infrastructure investment/maintenance costs, reduced demand for transportation which would help to reduce CO_2 emissions from transport, and it will provide a greater diversity of activities in the neighbourhood meaning the area is used throughout the day not just during working hours.



Source: Atkins

Mixed uses – these areas need to provide a true mix of uses, rather than a dominant use that is supported by a small amount of other uses. This will mean providing a balance of jobs to homes, so there are opportunities to live and work in the same neighbourhood. These homes and jobs will need to be supported by social infrastructure (schools, health care etc.), and leisure and cultural attractions that appeal across the community.

Continually curated – flexibility and adaptability entails a constant understanding of the life and needs of the cluster. There could be a live, open-source, business map showing the trends in growth and contraction, enabling proactive support and nurture of the cluster. The map could also be a tool for both collaboration amongst businesses and to facilitate community engagement on issues that affect the area.

Local retail and lifestyle markets – traditional shops and supermarkets are in decline as patterns are changing towards online and convenience shopping. The Curated Cluster 'market' will instead offer 'try before you buy' showrooms, local and independent retail and lifestyle uses such as, cafés and restaurants, gyms and health clubs, theatre and cinemas and other cultural venues. There will also be a move towards the traditional market.

Co-located services – provision of multiple public services (such as health care and social services and Council services) in an integrated way should be the model of choice. Clearly there are challenges with delivering services in a joined up way, however we are now in the era of digital service provision, and rapid technology change will make services increasingly accessible to all. Curated Clusters provide an opportunity to plan new infrastructure and services creatively around areas that are highly accessible and attract to a high volume of people. Services can be provided within new transport interchanges or within lifestyle malls.

Car-free – the growth of car sharing and the decline of personal car ownership, coupled with new and upgraded public transport along with an extensive network of walking and cycling infrastructure will allow the area to be built with minimal space given over to the private vehicle.

Green – networks of high quality public space and green infrastructure will be crucial to creating clusters that promote healthy lifestyles, are environmentally sensitive and adapted to climate change and have high standards of place making. These networks will incorporate both traditional forms of green space (parks and recreational spaces) and more innovative green space solutions such as floating parks and vertical parks. They will also link with the existing network of green infrastructure and seek to maximise on the ecosystem services that the network can offer.

Green Infrastructure Trust - public realm and greenspace would be placed in trust and owned and managed by the local community avoiding the recent trend in large development projects where public space is privately owned and controlled.

Delivery - issues to consider

- Who are the curators? This will vary from place to place, but will often include a similar set of stakeholders including the local authority, key land owners, public service providers and most importantly the community and businesses within the area - all working together to positively manage the places.
- The growth of data availability and mobile technology will allow the creation of digitally enabled communities that can help to continually curate the clusters from the bottom up.
- Land ownership in these areas is important. To achieve the principles of the Curated Cluster there will be a need to assemble land but local authorities should encourage owners to work collectively, so that an element of organic growth can occur.
- Planning policy and planning obligations can help support principles such as affordable business space. The definition of affordable business space would need to be defined locally based on current market rates and would need to be set at a level to ensure scheme viability.
- Local authorities may need to be flexible in what they require from developments in these areas, so that the area as a whole achieves the principles of the Curated Cluster rather than each individual development. This might require an area based approach to affordable business space and affordable housing.

CASE STUDY: Barking Riverside at the A13

This is a predominantly industrial area located in the Barking Riverside Opportunity Area to the north of Barking Riverside development between the A13 and C2C railway serving Fenchurch Street. The area is dominated by through traffic on the A13, which causes pollution and severance issues. The planned extension of Overground to Barking Riverside provides an opportunity to unlock this site.

The concept masterplan proposes to put the A13 in a tunnel to help improve connectivity of the site with the surrounding area, unlocking the site for about 5,000 homes in a high quality walkable neighbourhood making use of compact mixed use blocks. The scheme generally proposes a mix of uses and active frontages at ground level with residential units above.

New public transport infrastructure will also be key to driving development of the site, with a new Overground station allowing for the creation of a neighbourhood centre (restaurants/ cafés, shops, leisure uses) around attractive public spaces (including public squares and a linear park) the inclusion of roof terraces provides an additional public space offer for the local community. Generous provision of pleasant and sheltered cycle and pedestrian routes play an important role in the success of this neighbourhood by integrating and connecting key facilities, whilst a greater level of pedestrian permeability is achieved. Smart technologies will be used in the local bike share scheme which is designed to ease the access to the local station and key destinations across the neighbourhood.

Crucially the site would have a broader range of employment opportunities relocating heavy industry and re-providing employment uses that are compatible with residential uses (such as light manufacturing, processing and storage) in mixed blocks with ground floor employment use and residential above. In line with local aspirations, a degree of live/work units across ground and first floors provide further local employment opportunities.

Environmental quality will be enhanced, with air and noise pollution reduced by tunnelling the A13 and an improved public realm and landscaping.

Ultimately, the proposed development model embodies the principles of the contemporary smart and sustainable city. Technologies intertwined with human scale places contribute to creating the most pleasant experience possible. The mix of uses and higher densities make the neighbourhood lively at all hours of the day and, indirectly, entice social interaction. The development model also provides additional local employment opportunities, promotes a healthier lifestyle by reducing the need for the use of private vehicles.

Source: Atkins

PROPOSAL 4

A strategic approach to green infrastructure

Risks tackled

Housing – housing supply and affordability tackled through release of Green Belt.

Economy – London's attraction to talented people maintained through quality of life improvements.

People – social equity improved by community taking over management of green space.

Environment – environmental quality is improved by emphasis on green space provision and reduction of flood risk.

London is known globally for its high level of green and open spaces including many flagship parks which help define the image of the city. As London grows, these assets will be ever more essential for residents and visitors, and London's future resilience will need more green spaces. An imbalance in the location of provision and London's clear lack of supply of suitable land is one of the key obstacles to housing Londoners to the standards that befit a world city. Brownfield land first is the top priority for delivering more housing. But given the rapidity of population growth that we have identified, it is also time to critically address the Green Belt. However, the Green Belt should not be viewed in isolation. It is part of London's strategic green infrastructure network and should be considered as such.

Pan London strategic review of the Green Belt – some areas of the Green Belt and Metropolitan Open Land consist of poorer quality land. Some parts are no longer fulfilling the original purposes of the designation. Indeed some places in the Green Belt have good transport connections that would support the development of new affordable and sustainable housing. London needs to make some tough decisions in order to prioritise a realistic housing strategy. There is a need to review Green Belt and Metropolitan Open Land designations across London in a consistent manner. This review should be led by the GLA in partnership with the London boroughs.

Make better use of the Green Belt and Metropolitan Open Land – Green Belt represents an important amenity and recreational asset for London yet at present only 13% of London's Green Belt is used as parkland or has public access[107]. As London continues to grow it will be important that London taps into this valuable resource, to meet the recreational and amenity green space needs of the population. This will mean where possible seeking to open up public access to areas of the Green Belt that are currently inaccessible. The most likely way of achieving this is through some appropriately placed development that allows open space to be provided alongside new communities. An ecosystem services appraisal could be used to help assess the multi-functional value of spaces and decisions regarding their future role including potential scope for enhancement.

Strategic land swaps – many of London's development opportunity areas are in areas at risk from flooding and, as we have identified, the risks are likely to increase. Current land use planning directs development away from flood-risk zones. But there is a need for a much bolder vision which integrates quality of life and London's development needs.

There should be large scale strategic swaps of land. Proposed or previously developed land in flood-risk areas could be turned into parks and green infrastructure. In turn, parts of the Green Belt or land currently used as open spaces could be developed for housing or other uses. A net gain in London's common wealth of green infrastructure would boost the city's resilience to climate change.

Provision of new green infrastructure – with an ever increasing population that desires access to green space but with land a scarce commodity, there will be a need for imaginative solutions to green space provision. Some of these could be fairly small scale interventions such as the 'create a park' concept (see case study opposite). As well as developing green infrastructure alongside new homes and employment areas, it will be important to build green infrastructure alongside new infrastructure. A good example of where this is happening is the Thames Tideway Tunnel, where new areas of public open space will be created as a by-product of the infrastructure that is being created.

107. London First (2015) The Green Belt a Place for Londoners?

Green Infrastructure Trusts – there is a need for a strategic approach to the creation of green infrastructure that seeks to improve the multi-functional value of green space (recreational, amenity, ecological, educational, cultural value etc.). A Green Infrastructure Trust could be a model which is used to manage and expand development of London's green infrastructure network including a programme of major capital improvements. A trust model could be funded by local taxes, a Community Infrastructure Levy and Developer Contributions and potentially other local taxes and charges (such as business rates). The Trust could be established at London level to provide an efficient basis to mobilise funding but working in co-operation with the Boroughs, local community partnerships and land owners regarding management and maintenance.

A step change in the provision and quality of greenspace.

The Lea Valley Park is funded by a precept on Council tax paid by London householders, an approach which could be extended to a city wide network of strategic green spaces to enable access to finance.

In 1927, the State of New York issued a bond to develop its parks system of national and state parks, an approach which was taken up across the USA. Re-payment of the bonds is provided from cash flows from local taxes and other revenues.

CASE STUDY: Create a park

Created from recycled plastic crates, the parklet is a modular, stackable and lockable form of crates that are versatile and adaptable to different locations and uses. The example shown is a parklet created by removing parking bays from a city road. Terraced crates provide seating, whilst the central area can be used as a small event space or as a kiosk.

The crates will create a stacked drainage system capturing water in a geo-cellular storage system below the terraces. The water is used to irrigate the planting through a solar powered irrigation system.

The parklet also offers potential air quality benefits by providing live air quality monitoring data, planting that improves air quality (ivy, mosses, lichens etc.) and a green wall barrier to the road side to reduce emissions.

The parklet could be funded through sponsorship across the city or on an individual basis by local businesses. The Central kiosk space could used on a rolling basis by artists, photographers and vendors (also providing a source of revenue).

Source: Atkins

CASE STUDY: Greater London national park

There is currently a campaign to create the world's first urban national park that encompasses the entire city. This is in recognition of the rich biodiversity of green space that we have in London which includes 'two Special Protected Areas, three Special Areas of Conservation, two National Nature Reserves, 36 Sites of Special Scientific Interest, 142 formal Local Nature Reserves, 30,000 allotments, 65,000 stands of woodland and an estimated 3.8 million gardens, each with their own unique potential for life to thrive'.

As well as being rich in biodiversity the green space in London offers 'A wealth of recreational opportunities are available across the Greater London National Park. In addition to being able to explore London's rivers, parks and gardens by bike or on foot, the more adventurous can plan to walk the London LOOP, a 152 mile (245km) long distance footpath that circles around the edge of the entire park'[108].

An urban national park will necessarily be different to the existing National Park designation, as there is a need to allow the city to grow unconstrained by the restrictions on development that National Park status infers. However the concept of a Greater London national park could provide some benefits as it could help define a more strategic approach to green infrastructure and generate consistency around management and funding of green infrastructure in the city.

CASE STUDY: Regeneration of Lordship Rec

Community restoration of Lordship Rec in the London Borough of Haringey. A users forum was established by the community to develop a community led vision to regenerate the site, lobby for funding and move to joint management of the site.

Alongside refurbishment of existing park facilities such as sports facilities, work has included the development of community oriented programming, a cooperative run community 'environmental hub', and a theatre. There have also been environmental improvements such as improvements to the river channel, new meadows and tree planting.

This community assets provide a valuable service in allowing people to come together and form new relationships and bonds, thus generating new common wealth.

Case Study Notes:

GLA, 2006. New town square gives new heart to Dalston. [Online]
Available at: http://www.london.gov.uk/media/mayor-press-releases/2006/11/new-town-square-gives-new-heart-to-dalston

Cornelius, N., & Wallace, J. (2010). Cross-sector partnerships: City regeneration and social justice. Journal of Business Ethics, 94(1), 71-84.

108. http://www.greaterlondonnationalpark.org.uk/about/

Delivery - issues to consider

- The Green Belt review will need the GLA to take a lead and would need to get buy in from all Green Belt local authorities to ensure this can be carried out and the outcomes of the review are accepted.
- The Mayor's Green Infrastructure Task Force will help to drive forward a strategic approach to green infrastructure in London.
- Developers already allow for requirements to provide onsite green infrastructure as part of their development proposals. Local authorities should work closely with developers to ensure developers are thinking innovatively about how they can meet requirements on site rather than seeking to pay a contribution to off-site provision.

New partnerships and delivery models

As a world city London has a high capacity to act to address the challenges highlighted in this report. However the range and complexity of challenges spans institutional and sectoral silos and requires many actors to agree and align their activity. As one of the world's largest cities the range and complexity of stakeholders has sometimes made it difficult to tackle London's challenges and make the most of the opportunities London has available to it.

While London is not alone in this challenge several gaps have emerged across institutional powers, finance and co-ordination of delivery which need to be addressed to unlock delivery.

Within this report we have already highlighted the opportunity of partnerships, including Curated Clusters, to unlock economic potential and a London Green Infrastructure Trust to deliver major improvement in public space provision.

Many of the Opportunity Areas and regeneration areas within London are long standing and progress has been slow in realising the potential of these areas. The ambition and potential of these areas is not currently matched by a sustainable investment or delivery model.

The use of development corporations including the designation of Mayoral Development Corporations for Opportunity Areas first used at Old Oak Common is a welcome move but further action is required to maximise the benefits for London.

Defining the vision – the approach taken to establishing an agreed vision for an area through development of Opportunity Area Planning Frameworks (OAPFs) and Development Infrastructure Funding studies to identify infrastructure requirements and potential funding is a valid approach but does not necessarily resolve the particular issues and challenges.

Opportunity for a more programmatic approach to management – planning and infrastructure studies often simply add up the list of requirements sector by sector without developing an adequate delivery strategy. Opportunities for efficiencies and cost savings from a coherent programme of delivery are missed. The cumulative potential of individual projects and schemes to deliver a wider range and scale of regeneration benefits for the community can only be realised where a programmatic approach (rather than viewing projects individually) is in place.

A long term and viable financing model – the up-front investment required to support land assembly and implementation of infrastructure improvements often lacks the full commitment of all the relevant public sector bodies. Also despite the existing funding mechanisms being in place for public sector bodies to secure an appropriate contribution from land owners and developers there remains an infrastructure funding gap.

In some parts of outer London the sales values at today's prices are insufficient to deliver a viable scheme on a fully commercial basis accounting for the costs of development, infrastructure and community requirements. To counter this a long term approach to create and sustain value and unlock viability and delivery at each stage.

The use of Special Purpose Vehicles (SPVs) provides a basis for sharing risk and reward among relevant interests. They could be tasked to deliver public and commercial objectives and take a long term view over say 15-20 years.

Opportunity for wider use of Local Asset Backed Vehicles and Land Value Capture – harnessing the use of London's public sector land and property could be one way to bridge the investment gap. The use of Local Asset Backed Vehicles have already been used by some local authorities such as Croydon in connection with proposals for Croydon Town Centre but there is potential for more widespread use of this approach. Opportunity areas where major public transport improvements are to be delivered have the potential to benefit from significant uplift in underlying land values which can be used to finance the improvements.

Greater devolution of fiscal mechanisms – internationally cities are able to develop and sustain their capital programmes as they have greater control over taxes and charges levied. If London were able to retain a greater share of taxes raised from its citizens then it would be better equipped to deliver its programmes for investment on a sustained basis. Retention of Stamp Duty Land Tax (SDLT) and extending the terms of business rate retention would further incentivise the Boroughs to pursue growth and fund the extension of public services to match an increasing population.

Easing the assembly and delivery of sites for development – one of the barriers to substantially increasing housing delivery is the need to assemble land from multiple owners and incentivise development of land. The acquisition and assembly of land by public bodies in the market or using compulsory purchase powers is a costly and time consuming process.

Many countries operate a system of land pooling or land readjustment to facilitate the assembly of land and premises for public benefit including Japan, Germany, South Korea and Taiwan. It enables an equitable and resource efficient mechanism to pooling land from various interests.

This system could be used to promote and deliver serviced land for development on a comprehensive basis incorporating all necessary infrastructure and land for public service provision. It has several features and potential benefits which cannot be delivered by existing land assembly and compulsory purchase powers:

- The mechanism has potential to be self-financing and represents a sustainable method to share the cost and risk of delivering infrastructure between the Government and land owners.
- It provides a formal legal basis for owners to share equitably in the land value uplift achieved through the assembly and servicing of land. The approach also has the potential to be extended to cover the development of real estate.
- The scheme allows for land readjustment schemes and masterplans to be instigated and managed by Government bodies. In some countries private landowners or developers may initiate schemes to handle projects where the number of landowners would be too unwieldy for a land owner agreement to be used.
- It allows a more flexible approach for re-titling in terms of the location and position of the future land parcels.

Piloting this approach on a limited basis such as within Opportunity Areas could complement existing approaches to land assembly and compulsory purchase.

A further challenge in London is to unlock the delivery of housing by incentivising development and disincentivising speculation in land development. Landowners can choose to leave land undeveloped whilst benefiting from the increased land value which results from public infrastructure investment that has been provided at no cost to the landowner. Countries including Hong Kong, Taiwan and France have introduced levies to tackle this issue to maximise housing delivery and economic development and disincentivise land speculation.

London should consider the potential of such a mechanism. Careful structuring of the proposals is required considering the types of sites, time horizons, level of charges and treatment of temporary uses to ensure the levy facilitates development and does not result in unintended effects.

Matching opportunities to finance

There is an emerging consensus that action is required to provide mechanisms which can better match finance to infrastructure investment programmes of countries and cities which can unlock the delivery of housing and community benefits'[109].

New models of brokerage and co-investment such as using blended finance and establishing green investment are being used to unlock projects.

Some cities such as Chicago have set up structures to bridge the information gap between the public and private sector and shape a new basis to fund projects which involves matching programmes and projects with a range of sources of finance reflecting specific investibility criteria.

London has the breadth and depth of expertise in finance, legal and technical advice to draw upon. There is an opportunity to consider how it can utilise the expertise available to develop new solutions.

CASE STUDY: Government of Bahrain

Atkins supported the Government of Bahrain on developing proposals for implementation mechanisms to deliver the National Development Planning Strategy of the Kingdom.

Proposals for a system of measures including land re-adjustment and introduction of a levy on undeveloped land were developed with support of all Government bodies.

CASE STUDY: Chicago Infrastructure Trust

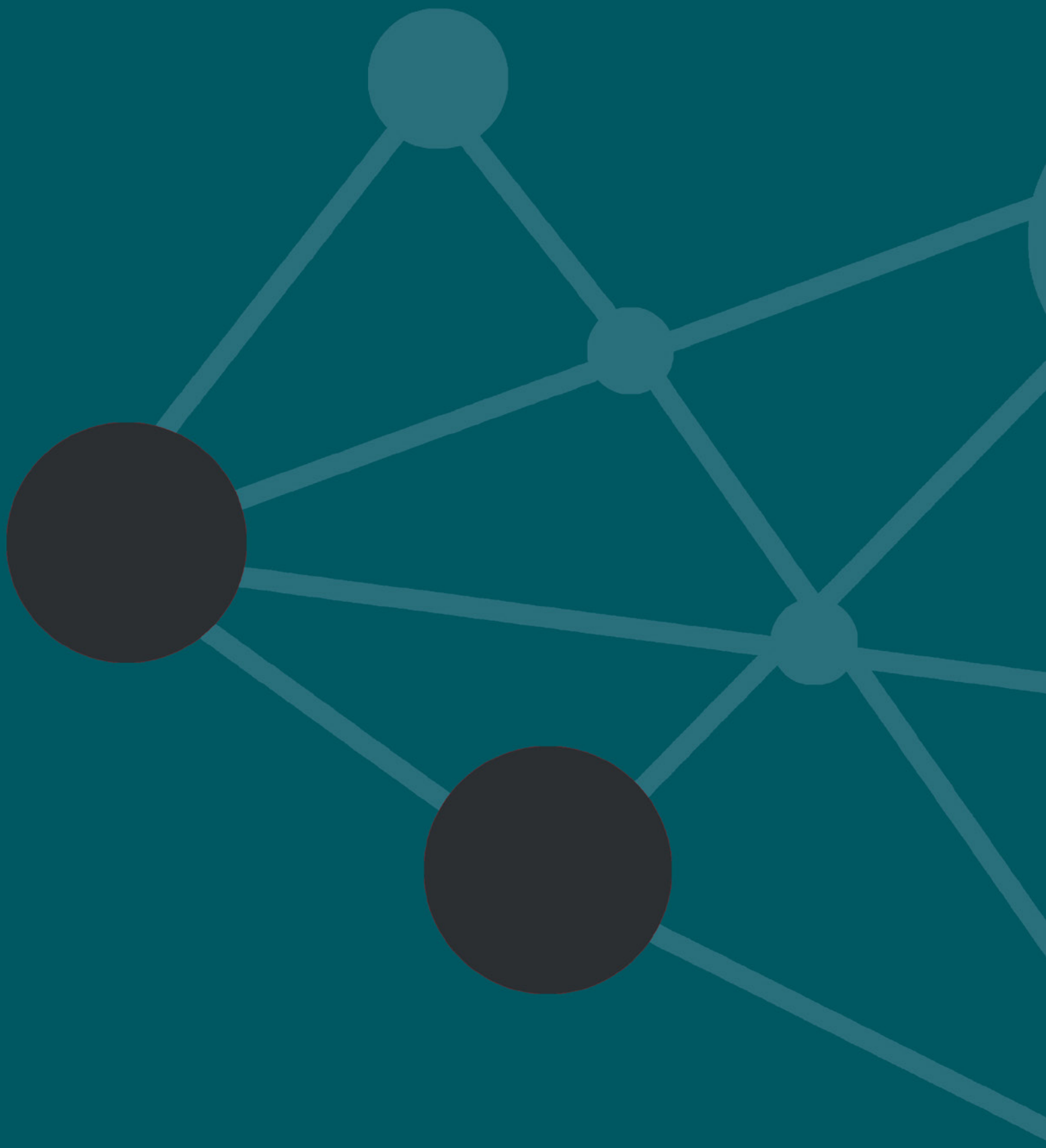
Three years ago Chicago established the Chicago Infrastructure Trust (CIT). This acts as a brokerage and clearing house which matches public infrastructure projects and private investors.

The approach provides a basis for a more collaborative approach to unlocking the city's growth. The city is paying for the CIT's $2.5 million running costs, while financial institutions, including Macquarie Infrastructure and Real Assets, Ullico, Citibank and JPMorgan, have committed to investing some $1.7 billion in the scheme.

According to initial plans, the CIT itself will provide some capital, bond financing and grants as well as offering tax-exempt debt to attract more investment. Returns on investment could vary from 3% on tax-exempt bonds to 8% for equity partners.

The city hopes to raise about $7 billion in total to finance improvements to streets, parks, water and sanitation, schools, commuter rail and O'Hare Airport as well as deliver low carbon buildings and transport programmes. The private sector will invest money in projects and receive returns via tolls, user fees, premium pricing or tax breaks.

109. Allianz (2014) Investment in Green Cities: Mind the Gap. Allianz, Munich. London First (2015) London's Infrastructure Investing for Growth, London First, London.



Our world city: risks and opportunities for London's competitive advantage to 2050

FUTURE PROOFING LONDON

07

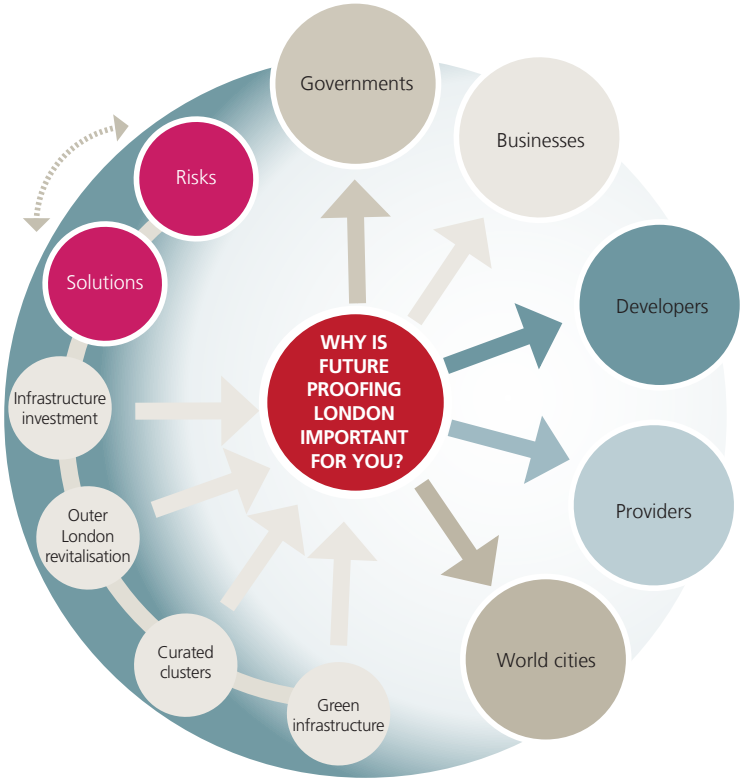
CONCLUSIONS

Conclusions

What does Future Proofing London mean for me?

London currently has a competitive advantage over most if not all the leading world cities. This success is of great importance to both the city itself and the UK as a whole. However, the city's success comes with additional pressures from population and jobs growth that need to be addressed through new housing development and supporting infrastructure. The competitive advantage of London is at risk for various reasons some of which are beyond London's direct control, but some of these risks are related to how the city plans for its growth.

We have developed a Future Proofing Cities approach that identifies risks and provides solutions that if implemented can help to manage those risks. The risks will be of relevance to a variety of stakeholders, as will the solutions that we have put forward and the Future Proofing Cities approach.



Key messages for Government

Why is Future Proofing London important for you?

Future Proofing London is important to the Mayor of London and London Boroughs because they have a key responsibility to ensure London continues to meet the needs of those who live and work in the city. Future Proofing is also important to the UK Government, because London's success is crucial to the UK's success given the city's share of UK GVA, jobs growth and high value employment.

Risks – the Mayor and the London boroughs have a significant role to play in tackling the risks that London faces. These include helping to deliver housing that meets future needs and tackles housing affordability; maintaining a balanced economy by retaining land for employment uses and support growth sectors; assisting social equity by providing infrastructure in a more equitable way; and promoting a more environmentally sensitive approach to development and infrastructure planning.

Solutions – government has a role to play in helping to ensure the solutions identified are a success:

Prioritising infrastructure investment – government departments would need to consider how infrastructure investment decisions can better assess and reflect the risks that London faces and to support the exploration of new funding and delivery models. London Boroughs will need to work closely with the GLA and infrastructure providers to align investment priorities more closely.

Revitalising outer London – the GLA and outer London authorities will need to drive forward the revitalisation of outer London centres. The London boroughs will need to consider what role their centres play in a changing London economy and how these centres can best be planned and managed in a way that allows each centre to maximise their potential for homes, jobs and quality of life.

New Partnerships and Delivery models – government holds the key to putting in place mechanisms to help enable delivery and to set the framework of incentives to catalyse other actors to support the development of London. Action is recommended to review opportunities for Curated Clusters, Green Infrastructure Trusts and the range of options for improved partnerships and delivery models.

Curated Clusters – the GLA and London boroughs have a crucial role to play to ensure major Opportunity Areas are developed in a way that creates neighbourhoods that are future proofed against the risks London faces. These should be places that have managed environmental risks, provide a mix of houses and jobs and create mixed communities.

Strategic approach to green infrastructure – the GLA must lead a strategic view of green infrastructure in the city, especially a strategic review of Green Belt and consideration of Metropolitan Open Land. London boroughs will need to be key partners in this review, and influence developers to deliver innovative new green infrastructure for a growing population and ensure the wider environmental benefits of green infrastructure are realised.

Key messages for businesses

Why is Future Proofing London important for you?

Future Proofing London is important for businesses because they need to continue to attract investment and a skilled labour supply to ensure they can thrive and grow. To achieve this London needs to remain competitive in the global economy.

Risks – businesses have to be aware of the risks London faces so they can manage and plan for them. London businesses can play a role in Future Proofing London by raising concerns with government about issues such as labour supply shortages and infrastructure investment. Business also has a key role to play in assisting Londoners to access job opportunities.

Solutions – businesses have a role to play in helping to ensure that the solutions identified are a success:

Prioritising infrastructure investment – business leaders need to engage with government and infrastructure providers to make it clear what infrastructure they need to ensure their business and the economy can continue to grow. This valuable insight will help to make better informed infrastructure investments.

Revitalising outer London – businesses should look to outer London and the potential it offers as a business location.

Curated Clusters – businesses need to work with local authorities and developers to identify how their premises needs are projected to change in the future. This will allow the land use mix and the type of premises developed in Curated Clusters to reflect these business trends and build in flexibility for businesses to adapt to changing economic conditions.

Strategic approach to green infrastructure – business can help to support the delivery of green infrastructure by providing a revenue stream (either through sponsorship or through taking concessions based in green infrastructure e.g. kiosks) to provide new green spaces and their continued maintenance.

Key messages for property developers

Why is Future Proofing London important for you?

Future Proofing London is important for developers because they need to understand the trends affecting the city as these will impact on the types of development they build, where they build and what will be required of them to make the development future proofed.

Risks – developers have a key role to play in addressing risks by delivering a supply of different types and tenures of housing to meet London's future needs and to help tackle housing affordability issues; helping to maintain a balanced economy by developing commercial premises that meet London's changing economic needs; assisting social equity by delivering social infrastructure alongside their housing and commercial developments; and delivering a more environmentally sensitive approach to development.

Solutions – developers have a role to play in helping to ensure that the solutions identified are a success.

Key messages for infrastructure providers

Prioritising infrastructure investment – developers already help to fund infrastructure delivery to support their developments, they will need to work with local authorities to ensure that infrastructure can be prioritised in a more socially equitable way.

Revitalising outer London – outer London provides developers with an opportunity to deliver housing and commercial premises. Developers will need to work with local authorities closely to ensure that aspirations for outer London are realised.

Curated Clusters – developers are key to delivering opportunity areas as 'Curated Clusters', and they will need to consider how they can incorporate the principles of the curated cluster in their existing approaches to large scale developments.

Strategic approach to green infrastructure – it's crucial for developers to deliver green infrastructure as part of their developments, because it increases the value and saleability of their product.

New Partnerships and Delivery models – business should play an active role in helping to shape new mechanisms to help unlock delivery to support the development of London.

Why is Future Proofing London important for you?

Future Proofing London is important to infrastructure providers as London's rapidly growing population is putting additional pressure on infrastructure including its hard infrastructure such transport networks and utilities, and its social infrastructure such as schools, health care and green infrastructure.

Risks – infrastructure providers have a key role to play in addressing risks by helping to deliver infrastructure that helps to unlock housing supply; delivering infrastructure that will help support a balanced economy; assisting social equity by delivering social infrastructure; and delivering infrastructure that is future proofed for changing environmental conditions.

Solutions – infrastructure providers have a role to play in helping to ensure that the solutions identified are a success.

Prioritising infrastructure investment – infrastructure providers will need to consider the risks London faces when planning and appraising infrastructure investments, and the role that infrastructure can play in Future Proofing London against those risks. Making use of 'big data' will help infrastructure providers to plan infrastructure investments more intelligently.

Revitalising outer London – new and upgraded infrastructure will be crucial to helping revitalise outer London. Infrastructure providers can help to unlock housing and growth potential of outer London.

Curated Clusters – provide an opportunity for social infrastructure providers (such as health care and other services) to be provided in a more coordinated way.

Strategic approach to green infrastructure – it will be important to build green infrastructure alongside new infrastructure.

New Partnerships and Delivery models – infrastructure providers have potential to benefit from enhanced data available to support improved planning and service delivery. New mechanisms to unlock growth can assist in improving access to finance for capital programmes serving areas of population growth. Public bodies and regulated utilities have a role to play in using their land and property assets to support the delivery of Opportunity Areas and other major development in London.

Key messages for world cities

Why is Future Proofing London important for you?

Future Proofing London is important to leaders of other world cities as they will be dealing with similar pressures.The Future Proofing Cities approach is relevant and applicable to cities world-wide as they plan for the significant challenges of the future.

Risks – leaders of other world cities should be aware of the risks that they will face in the future, so they can develop solutions for managing those risks and methods for planning to future proof development and infrastructure investments in their city.

Solutions – Future Proofing London offers solutions that could be applicable to other world cities.

Prioritising infrastructure investment – making use of big data will help infrastructure providers to plan infrastructure investments more intelligently.

Revitalising outer city areas – in many cities around the world suburbs have developed as the city population has grown, but these areas often suffer from a lack of a significant economic function and growing poverty. As such the solutions around revitalising outer London will be useful to cities where similar issues are evident.

Curated Clusters – although local circumstances will necessitate that the approach is adapted to each city, the principles of Curated Clusters provide a blueprint for how new urban neighbourhoods can be created in a way that is future proofed.

Strategic approach to green infrastructure – provision of new green infrastructure is a key requirement for all growing cites and is particularly important for world cities that thrive because of their quality of life. Innovations in green infrastructure provision which allow city residents access to green space, whilst enabling the multiple benefits (environmental etc.) that green infrastructure provides for a city.

New Partnerships and Delivery models – London is already a pioneer in developing new partnerships and delivery mechanisms to support growth and improving the quality of life in cities through examples such as congestion charge schemes, the use of development corporations and use of planning powers to secure delivery of supporting infrastructure, open space and community facilities. Networking platforms can enable cities to share knowledge of what works and help the diffusion of practices which can improve competitiveness and tackle their future needs. A future proofing approach offers potential to be adapted to address the needs of other cities in different geographies evidenced by take up not only in Europe but in Asia, Africa and the Americas.

GLOSSARY

Glossary and abbreviations

Glossary of terms

Adaptation to climate change: adjustment in natural or human systems (e.g. cities) in response to actual or expected climate hazards or their effects. It moderates harm or exploits beneficial opportunities of climate change. Various types of adaptation can be distinguished, including anticipatory, autonomous and planned adaptation.

Agglomeration economies: relates to the benefits firms obtain when locating near each other or 'agglomerating'. This concept is related to economies of scale and network effects. As more firms cluster together they usually take advantage of declining production costs, more suppliers and more customers. Cities and specifically urbanisation promote economies of agglomeration.

Blue-green infrastructure services: represent the sum of natural and manmade infrastructure covering the hydrological cycle (blue infrastructure), natural habitat, ecosystems and urban greenspace (green infrastructure). The approach to blue-green infrastructure adopts a systems view in order to identify the links and interconnections between issues in order to avoid disbenefits and help to maximise win-wins. By taking this approach a wider range of socioeconomic and quality of life benefits can be delivered.

Capacity to act: there is a wide range of definitions according to the specific context. We define this as a city's capacity and willingness to respond positively to risks. This is shaped by the economic and institutional attributes of a city and its actors, which determine the degree of its capability to respond to risks.

Central Activities Zone (CAZ): the London Plan defines the Central Activities Zone policy area, which comprises the City of London, most of Westminster and the inner parts of Camden, Islington, Hackney, Tower Hamlets, Southwark, Lambeth and Kensington and Chelsea.

Circular economy: an alternative to a traditional linear economy (make, use, dispose) in which we keep resources in use for as long as posssible, extract the maximum value and regenerate products and materials at the end of each service life.

Climate change: the United Nations Framework Convention on Climate Change (UNFCCC) defines climate change as 'a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods'.

Common wealth: the shared social and often free elements of the city such as parks, museums, cultural events, sports facilities etc.

Competitive advantage: a condition or circumstance that puts a company, city or country in a favourable or superior business position over competitors.

Competitiveness: the ability and performance of a firm, sub-sector or country/city to sell and supply goods and services in a given market, in relation to the ability and performance of other firms, sub-sectors or countries/cities in the same market.

Ecosystem services: the benefits people receive from ecosystems including products like clean drinking water and processes such as the decomposition of wastes.

Gross domestic product (GDP): the total value of goods produced and services provided in a country during one year.

Gross value added (GVA): the value of economic output less the value of intermediate consumption (goods and services consumed); it is a measure of the contribution to GDP made by an individual producer, industry or sector.

High value added sectors: economic sectors that generate a large margin between the final price of a good or service and the cost of the inputs used to produce it, thus creating higher profits for businesses and higher wages for workers.

Human capital: is the stock of knowledge, habits, social and personality attributes, including creativity, embodied in the ability to perform labour so as to produce economic value.

Index of Multiple Deprivation (IMD): an overall measure of multiple deprivation experienced by people living in an area and is calculated for every Lower layer Super Output Area (LSOA) in England.

Lower Super Output Area (LSOA): is a geography used in the UK for the collection and publication of small area statistics (first used for the 2001 Census).

Permitted Development Rights: a national grant of planning permission (in the UK) which allow certain building works and changes of use to be carried out without having to make a planning application.

Productivity - an economic measure of output per unit of input. Inputs include labour and capital, while output is typically measured in revenues and other GDP components such as business inventories. Productivity measures may be examined collectively (across the whole economy) or viewed sector by sector to examine trends in labour growth, wage levels and technological improvement. Productivity is considered a key source of economic growth and competitiveness and, as such, is basic statistical information for many international comparisons and country performance assessments.

Small & Medium Size Enterprises (SMEs): In the UK, sections 382 and 465 of the Companies Act 2006 define a SME for the purpose of accounting requirements. According to this a small company is one that has a turnover of not more than £6.5 million, a balance sheet total of not more than £3.26 million and not more than 50 employees. A medium-sized company has a turnover of not more than £25.9 million, a balance sheet total of not more than £12.9 million and not more than 250 employees.

Social mobility: the degree to which people are able to move up and down the social ladder, from one generation to another.

Surface water flooding: this occurs when rainwater lies on or flows over the ground instead of soaking in or draining away through the normal drainage systems.

World city: also called a global city, is a city generally considered to be an important node in the global economic system.

CAZ – Central Activities Zone

CBA – Cost Benefit Analysis

CIL – Community Infrastructure Levy

DfT – Department for Transport

EA – Environment Agency

EU – European Union

FALP – Further Alterations to the London Plan

GLA – Greater London Authority

GVA – Gross Value Added

HMT – Her Majesty's Treasury

JSA – Job Seekers Allowance

LSOA – Lower Layer Super Output Area

NHS – National Health Service

NPPF – National Planning Policy Framework

PDR – Permitted Development Rights

SMEs – Small and medium sized enterprises

TfL – Transport for London

UHI – Urban heat island

UK – United Kingdom

USA – United States of America

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