

Review of the case for Large scale Transport Investment in London

A Report for the National Infrastructure Commission
March 2016



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This Report

This report has been prepared for the National Infrastructure Commission to inform their study of London's public transport investment needs. It sets out recommendations put forward by an expert panel brought together in February 2016 to provide expertise and advice. The expert panel consisted of senior advisors at Steer Davies Gleave, Quod, Grant Thornton, Credo and Albion Economics along with Tom Worsley, visiting fellow at ITS Leeds and Martin Tugwell, Programme Director at England's Economic Heartland Strategic Alliance/Buckinghamshire County Council.

The panel's remit was to review the strategic and economic cases for large scale transport investment in London (including, and specifically, Crossrail 2) and the assumptions upon which business cases are premised. The review was to give consideration to: funding and financing; housing; transport appraisal; the relationship between transport and London's economic performance; and relevant international comparators.



Executive Summary

The Need for Investment in London

Employment and population growth in London is happening on an unprecedented scale; in 2015 London's population became larger than in any time in its history and it continues to grow. There is no realistic scope to accommodate the additional travel this will generate on the capital's congested road network, where, in any event, there is a need to devote more space to increased pedestrian and cycling activity and other public use. As a result, Transport for London forecasts **demand for travel by public transport will increase by 60 percent to 80 percent by 2050**¹ – which is within the horizon of needing to start to plan and deliver major transport infrastructure investment.

Even if there was a significant change to economic patterns or significant public policy to encourage a shift in activity away from London, there is little risk that significant investment is not needed as the city will continue to attract job growth and London will need to remain internationally competitive.

There is a substantial programme in place to increase the capacity of the London Underground network, with new train fleets, station upgrades and (by means of new train control systems) higher service frequencies. This includes maximising the capacity of the London Underground network: increasing train frequencies up to as many as 34 to 36 trains per hour across the Jubilee, Piccadilly and Northern lines with complementary investment in station capacity.

The value of current investment proposals is significant. Examples including the £5.5 billion investment in the modernisation of the sub-surface Underground lines including new trains and signalling, station capacity upgrades at Victoria and Bank (over £1 billion). There is substantial investment on improvements to the London Overground system to increase its capacity and enhances its reliability.

In addition, coming on-stream fully by 2020 will be Crossrail 1 (£15 billion) and Thameslink (£6.5 billion) – two high capacity regional express routes, running east-west and north-south across the central area and beyond into the surrounding shire counties. There is also a further package of major project investment proposals that TfL is progressing including: the Northern Line Extension to Battersea (under construction); East London River Crossings (Silvertown, Belvedere); Bakerloo Line Extension to Lewisham/Bromley; and tunnelled highway improvements.

But the current Mayor's Transport Strategy, which supports this set of interventions, is based on growth assumptions far lower than those that have actually occurred during recent years (albeit that the London 2050 Infrastructure Plan is based on more updated projections).

The continuing growth of London places strains on its transport system, which if not met, will result in increased overcrowding, poor service reliability and congestion and additional costs for businesses and longer journeys for residents. Overcrowding is one of the greatest barriers to disabled and older people travelling on the network². By 2035 it is projected that the number of over 80s living in London will be 70 percent higher than in 2015. Even with the planned network improvements, by 2041 there is a forecast increase in crowded hours of 92 percent over 2011 levels compared with growth of 50 percent in demand. This indicates that by 2041 conditions will have worsened with the average travel time per passenger increased over the 2011 levels as the network carries additional demand³.

¹ London Infrastructure Plan 2050, Transport for London, 2014

² Understanding the travel needs of London's diverse communities, Transport for London, 2014

³ TfL, Crossrail 2 Business Case, 2015

Large Scale Public Transport Investment Crossrail 2

The pace of demand growth is such that more capacity will be needed, beyond the levels that will be created by these existing commitments⁴. These pressures are evident – in fairly equal measure – on the London Underground network and on the national rail network on its approaches to central London. There are three components to the capacity challenge:

- at and around the central London terminals;
- accessing the Central Activity Zone⁴; and
- meeting the growth expected to the east side of London.

There are multiple gaps in the transport infrastructure (existing and committed) when considered against the needs set out in the Mayor’s Plan for London in 2050. No single transport intervention is capable of fulfilling all of these gaps. The best response in terms of infrastructure investment would be a combination of the following types of measure:

- further cross-London links (of the Crossrail/ Thameslink style) because, well-directed, these can resolve multiple weaknesses (gaps) and bring an intrinsically more efficient operation;
- completion of the London Underground and Docklands Light Railway line by line capacity uplifts, and implementation of measures to increase the capacity of the suburban rail network (metro-style trains and services); and
- selected main radial route development of the national rail network – noting that large-scale capacity uplifts will rarely be justified by serving markets on a like-for-like basis (so connections to high volume movements or new catchments such as airports or national high-speed rail connections offer the best prospects).

Crossrail 2 matches well against London’s challenges of congestion on the network as a whole, particularly national rail termini, by providing a cross-London link. As well as relieving congestion, it also reduces the need to interchange between national rail and the London Underground at Waterloo, Euston and Liverpool Street. It relieves Victoria, Northern (Morden branch) and Piccadilly Line congestion; creates a substantial uplift in the capacity of the South West Main Line into Waterloo, which means much needed additional capacity for services from Hampshire and Surrey (and indeed Dorset, Wiltshire and Devon), routes that are today subject to excess demand over significant distances. Similarly, it provides direct access from south west London to the planned High Speed 2 terminus at Euston and potentially facilitates major housing development in key opportunity areas.



Figure i: Proposed Crossrail 2 route map
Source: Crossrail 2 Website, 2015

⁴ The Central Activities Zone broadly being the West End, the City of London and Nine Elms Corridor

There are other schemes at various stages of development, and some of these could be examined in the East London Transport Study, now underway. Options here include the possible addition of an eastern branch to Crossrail 2, and an extension of the Docklands Light Railway westwards from Bank to Euston. A southward extension of the Moorgate City Line to Cannon Street and Waterloo or connection between the Lea Valley, Stratford, the Isle of Dogs and Brighton Main line could also address the infrastructure gaps (both possible 'third Crossrail' schemes).

Making a Case for Investment

All transport infrastructure investment in the UK requiring public funding uses the 'Five Case Model' approach to the development of business cases. It is a well-established approach and considered to be international best practice, the principle being that all publicly funded investment should be assessed in a consistent manner to enable prioritisation and trade-offs between investments. The 'Five Case Model' also supports the development of affordable, deliverable and value for money schemes.

Within this model the Strategic Case sets out the rationale of why intervention is required. Its principal audience is the decision maker (and in the context of large scale investments this is principally Minister(s) or Parliament, although in the case of London, where there are substantially devolved powers, the Mayor of London and Greater London Authority (GLA) are also involved). The Strategic Case sets out the impacts that matter to policy and decision makers, including some which are not part of the economic case.

The Economic Case articulates the transport investment's value for money which is based, in the first instance, on the project's Benefit to Cost Ratio (BCR). This includes Wider Economic Benefits, which are additional to conventionally-measured transport benefits such as journey time savings. For large public transport investment schemes that serve areas of large-scale economic activity, especially those that take the form of business activity 'clusters', significant job and productivity impacts are likely to accrue through the further intensification of activity levels: the benefits to society of this shift in employment towards more productive locations form part of the sensitivity tests

run on the economic case. It is now common practice for the sponsors of major transport schemes to provide decision makers with an estimate or a range of estimates of the scheme's impact on the UK's Gross Value Added (GVA).

GVA analysis has value in providing a measure of the impact of an investment on changes to both the level and in the spatial distribution of economic activity. It can show where benefits arise and this is of great value in considering questions such as value capture for funding choices. The techniques and evidence to estimate GVA which seek to capture both the clustering and the labour supply effects are still evolving. There is, as yet, no standard approach. Evidence to date suggests that the different methods available might produce a wide range of results.

Where labour supply is a constraint to economic activity in more productive locations, additional housing may lead to net GVA gains. Such impacts are additional to those which result from opening up new land for employment. It is therefore important to consider GVA benefits in the assessment of the strategic and economic cases for a transport investment scheme to ensure all potential benefits are understood. Dependent development benefits are considered as part of the economic case, although they are not monetised.

As currently assessed, the BCR for Crossrail 2 is not high. One reason for this is that the standard (Transport Appraisal Guidance) forecasting and appraisal approach explicitly does not allow for any consideration of one of Crossrail 2's key design objectives, which is to open up land (in the Upper Lea Valley in particular) for large scale housing development. The BCR is based on with and without scheme case in which land use is assumed to be unchanged. This is the same short-coming that led to ex-ante assessments of the Jubilee Line Extension having a weak BCR, a situation which materially changed when it came to ex-post assessments.

A Transport Appraisal Guidance compliant approach to the case development also places a cap on demand growth which is likely to underestimate the benefits of interventions and may lead to the under-provision of rail services. In the absence of any empirical evidence regarding the likely trajectory of long-term demand and benefits, a range of alternative methods for

considering long term demand and benefits growth should be considered. Ignoring projected demographic growth after an arbitrary cut-off date would seem unwise. While this constraint applies to all transport schemes, its effect on projects in London would be proportionately greater if population and employment in London continue to grow faster than elsewhere in the country.

There are, in any event, continued opportunities to improve the case for Crossrail 2 as outlined in our report. These opportunities centre on the route and branch configurations, whether better connectivity can be provided to the fast growing areas to the east side of London (or whether this should be left to complementary investments); reducing its capital costs; and revised operating regimes.

Housing

Crossrail 2 has a close relationship with housing delivery – transport provides access, housing generates demand which leads to fare revenue and economic benefits. It offers land value capture opportunities. However, it also requires land use change which needs to be securely founded in planning policy. There is, for instance, little benefit in routing Crossrail 2 along the Upper Lea Valley if land use is not going to change in response. The promoters of Crossrail 2 cannot simply assume that planning policy will enable that land use change. A decision to commit to Crossrail 2 that is dependant on that land use change could be premature if it was in the absence of policy commitments to change land uses.

Planning and transport infrastructure consenting strategies therefore need to be aligned and a planning policy vehicle needs to be found to achieve that, for example, the London Plan, a National Policy Statement, a dedicated government policy statement or joint local plans produced particularly for either end of the route.

There may be a need for a multi-local authority plan that aligns housing delivery with infrastructure investment. This type of approach has been a feature of some of the devolution agreements that Government has agreed with combined authority areas across the country. Consideration should also be given to the nature of the delivery agency. For Crossrail 2, a Mayoral Development Corporation may be an option, although

more innovation may be necessary because of the scale and cross-boundary characteristics of the project. Greater direct involvement with delivery, as well as planning, would enhance the prospects that the land use change benefits would actually be secured, that they would be developed to a coherent plan, and that the opportunities for land value capture are optimised. Where the business case depends upon these outcomes, there is a strong case to ensure that Crossrail 2 is planned and delivered using comprehensive planning and delivery powers.

Funding

A variety of funding mechanisms are currently in place for Crossrail 1, which could be used for other large scale public transport investment and many of these have been highlighted for ‘rollover’ to Crossrail 2. In addition to these funding streams, there are opportunities such as user charging (higher fares or the implementation of road user charging to fund public transport) for example, land value capture and taxation to fund future infrastructure programmes and projects. These funding streams would rely upon a change in established policy. London has a distinct advantage in overcoming these barriers over other parts of the UK due to pre-existing governance arrangements. The stature and profile of the Greater London Authority and TfL are key components of this.

Ultimately, funding and financing envelopes will be formed on a project-by-project basis, and will be driven by the quantum of funding required for the project. Crossrail 1 is a prime example of this method, and demonstrates how Central Government funding can form a smaller part of the envelope. Crossrail 2, as a project, exemplifies the importance of land value capture as a funding stream, where the link between cost of the infrastructure, and those receiving direct financial benefit is clearly defined.

Outside of land value capture, user charging and general taxation are expected to remain part of the funding stream for large scale transport infrastructure in the future. The extent to which this is acceptable for decision makers and the public is a policy decision. The devolution of further fiscal powers, as identified in a number of other reports, could form part of these discussions in the future.

Conclusions

Reviewing the case for large scale transport infrastructure in London has demonstrated that there is a strong need for additional transport services to support and enable the predicted growth within London. To secure London's economic growth it is essential that a wide programme of investment in public transport is progressed, in which priorities and implementation timings can be adjusted over time, rather than a one-at-a-time prioritisation of single major investments. The scale of the challenge is simply too large for the approach which has characterised the approach to investment over the last twenty to forty years or so.

In order to alleviate congestion at London national rail termini and the London Underground network, as well as improving the onward journey for passengers, part of this investment should be to provide cross-London links. As well as congestion, growth in demand for travel needs improved connectivity (new and faster links) to enable a sustainable and realistic approach housing delivery and the job growth that London needs to prosper. Experience from cities such as Stockholm and Paris has shown the importance of providing cross-city services linking large population areas with employment.

Crossrail 2 provides significant opportunities to provide part of the transport connectivity needed to facilitate new house building (up to 200,000 homes). It is a transport infrastructure investment that can enable intensification of land use. However, development on the scale that Crossrail 2 could support will require a number of policy alterations. Without policy change, it will be difficult to provide the level of densification and number of homes forecast to support the investment case.

Our recommendation is to bring the planning of Crossrail 2 and its associated housing development closer together thorough the planning phase and specifically to investigate the means of achieving accelerated policy support for:

- intensification of land around stations, on both brownfield and Green Belt sites;

- re-designation of current Strategic Industrial Land; and
- increased density of development overall.

There are options for this policy co-ordination including specific Government policy statements such as a National Policy Statement although none are ideal and the scope and complexity of Crossrail 2 may require a unique policy response.

There may also be advantages to exploring the phasing of Crossrail 2 and to investigate the costs and benefits of each individual station. Although this review has not developed alternative options in detail, it would seem sensible that a couple of potential refinements could be reviewed in more detail (if not already undertaken) that could improve the BCR. These could potentially form part of a phased scheme.

Firstly, exploring a potential refinement of a branch to the east where development growth is expected to be high, potentially as part of a second phase, or as an alternative to the New Southgate branch assuming proposed depot facilities can be relocated. Secondly, a straightened and more direct alignment between Clapham Junction and Wimbledon via Earlsfield which has the potential to be delivered at surface level for part of the route to reduce cost. In theory, this may support a branch to serve Balham and beyond (such as the Brighton main line).

These potential refinements may improve the BCR. In addition, phasing the scheme could help enable increased land value capture.

The potential funding options proposed for Crossrail 2 appear sound, assuming the funding for Crossrail 1 continues as planned. There are a number of ways in which funding could be maximised to serve the challenge of 50 percent non central Government grant. To maximise this funding, again housing and development policy changes will be required, particularly to take full advantage of land value increase. The current governance structure in London with the GLA and TfL assists with this process, but greater devolution may assist further. The creation of a delivery vehicle with powers to secure and deliver the necessary land use change as well as the infrastructure would bring more confidence to the investment case.



1 How the case for investment in transport is made

1.1 Assessment framework: the five case model

1.2 Strategic and economic cases
and the relationship between the two

1.3 Transport investment as a means of unlocking
other benefits

1.1 Assessment Framework: the Five Case Model

All transport infrastructure investment in the UK requiring public funding must adopt the Government's 'Five Case Model' approach to the development of business cases.

The Five Case Model is a well-established approach and considered to be international best practice. Governed by HM Treasury's Green Book, it is articulated and detailed for the assessment of transport infrastructure investment in the Department for Transport's (DfT) Business Case model and Transport Appraisal Guidance (readily referred to as webTAG⁵).

The purpose of the Five Case Model is to ensure the best value for money is obtained through application of a consistent decision informing framework. It requires scheme promoters to evidence that:

- the proposed intervention is supported by a compelling case for change that provides holistic fit with other parts of the organisation and public sector – the Strategic Case;
- the proposed intervention represent best public value – the Economic Case;
- the proposed "deal" is attractive to the market place, can be procured and is commercially viable – the Commercial Case;
- the proposed spend is affordable – the Financial Case; and
- what is required from all parties is achievable – the Management Case⁶.

The underlying principle of this approach is that all publicly funded investment should be assessed in a consistent manner to enable prioritisation and trade-offs between investments and therefore the assessment framework requires scalability and proportionality (the former for wide application and the latter for efficient use of resources).

Scalability refers to the principle that the same approach can be applied to all investment assessments regardless of size. Proportionality refers to the principle that the extent or effort scheme promoters should go to in assessment of and monitoring of the scheme costs and benefits should be proportionate to the scale and risk of the proposed intervention.

These two concepts are very relevant to a discussion on large scale infrastructure investment when considering cases put forward by scheme promoters including an impact on the national economy versus investments where impact on the level and location of economic activity is no more than local.

1.2 Strategic and Economic Cases and the relationship between the two

The Strategic Case sets out the rationale of why intervention is required, as well as a clear definition of outcomes and the potential scope for what is to be achieved. It is expected to cover how the intervention fits with national, regional and local policies, drivers of change and a clear statement of the associated benefits, risks, constraints and interdependencies.

The Strategic Case is the explanation and justification of why the proposed intervention is needed, why action needs to be taken now and the consequences of failing to take timely action. Its principal audience is the funders' decision makers and therefore it sets out those impacts that matter to policy and decision makers, including some which are not part of the economic case. Decision making has now been mostly devolved and the impacts of the intervention at a local level may be of more relevance to local decision-makers in their concerns about the prosperity of the area they represent than the national perspective of the scheme provided by the benefit to cost ratio. For example an increase in local jobs and Gross Value Added (GVA)⁷ could provide a more meaningful metric for local decision makers but one which does not form part of the Benefit to Cost Ratio (BCR) from the economic case.

⁵webTAG being the Department for Transport's Transport Appraisal Guidance document website

⁶Public sector business cases, Using the five case model, Green book supplementary guidance on delivering public value from spending proposals, HM Treasury, 2013

⁷Gross Value Added (GVA) is an indicator of wealth creation, measuring the contribution to the economy of a specified investment in economic activity

The role of the Economic Case is defined in the DfT's value-for-money assessment guidance. The definition of value for money is based in the first instance on the project's BCR, derived from the costs and benefits which are quantified and valued in money terms in the Transport Appraisal Guidance. The unquantified benefits are then reviewed by decision-makers to establish whether, in their view, the magnitude of such impacts might be expected to change to a significant extent the monetised BCR. This modification to the BCR, which follows from including the impacts which are omitted from the conventional BCR, is of particular relevance to investors to understand the specific scheme BCR Assessment has traditionally looked at the transport benefits which estimate the social welfare benefits and costs of a scheme, relative to a 'do nothing' scenario. These welfare effects include journey time savings and reliability, and environmental and other factors.

Wider economic benefits are the impact of transport on productivity and Gross Domestic Product (GDP)⁸, and are caused by the existence of market imperfections in transport-using industries. These imperfections mean that the value individuals place on impacts may differ from those placed on it by society. Transport Appraisal Guidance seeks to include all benefits and costs, and so should include the best estimates of all wider benefits (or costs) including those arising because markets are imperfect.

Many welfare gains from transport schemes are themselves recorded as increases in GDP, but some are not. It is possible that some impacts on GDP do not reflect increases in welfare.

The relationship between transport and economic growth was reviewed in the 1999 Standing Advisory Committee on Trunk Road Appraisal (SACTRA) Report on transport and the economy⁹, which was followed up by research commissioned by the Department for Transport, and was also addressed in the 2006 Eddington Report¹⁰.

Following SACTRA and Eddington, the DfT supplemented the webTAG guidance with a requirement to estimate, where appropriate, benefits initially described as 'Wider Economic Benefits' and subsequently renamed 'Wider Impacts'. These included the effects of agglomeration, the impacts of imperfect competition, and certain labour supply effects. The Wider Impacts for which detailed guidance is now provided in webTAG are:

- agglomeration impacts: the benefits of the change in productivity firms derive from an increase in accessibility when firms are located in close proximity;
- output change in imperfectly competitive markets: welfare gains above the cost of production that result from an increase in output generated by a transport improvement;
- labour supply impacts: benefits generated by more people deciding to enter the workforce in response to a transport investment reducing the costs of participating in the labour force; and
- move to more or less productive jobs: benefits brought about by members of the labour force deciding to move to areas of employment where they will be more productive in response to a transport scheme.

The value put on agglomeration benefits in the cost benefit analysis is measured by the additional output produced on account of the increase in accessibility. The costs of delivering the change are accounted for in the transport scheme costs. Consumers benefit from the increase in output, in much the same way as they benefit from a comparable increase caused by reductions in business transport costs.

⁸Gross domestic product (GDP) is the monetary value of all the finished goods and services produced within a country's borders in a specific time period

⁹Transport and the economy: full report, Standing Advisory Committee on Trunk Road Appraisal, 1999

¹⁰The Eddington Transport Study, The case for action: Sir Rod Eddington's advice to Government, December 2006

The labour supply effects have two effects on the cost benefit analysis. The first is the value to the individual who is induced to change behaviour. Since the individual could always have joined the labour force or worked in the more productive job before the scheme opened but chose not to do so, the benefit to the individual can be no more than the benefit they get from the scheme, measured by the change in transport costs (or to be more precise, half of the value of the change)¹¹. We can assume that although the individual was induced to change behaviour because of the higher post-tax salary provided, adequate recompense for the greater responsibility, longer journey or additional effort of the more productive job is provided. For society in general, benefits are gained from the additional tax revenues collected by Treasury on the new or, in the case of the move to a more productive job, the higher earnings. Therefore the additional tax take on the additional earnings is counted as a welfare benefit in webTAG. A measure of GVA would, however, include all of the additional earnings as such a metric takes no account of the additional effort, loss of leisure hours etc. associated with the individual's input into realising the higher earnings.

The economic case guidance within webTAG sets out to measure those Wider Economic Benefits, highlighted above, which are considered additional to conventionally measured transport benefits. Because of the continuing debate around the methods and parameter values of this quantification, webTAG currently requires these benefits to be included as a sensitivity test only.

The measurement of GVA impacts of transport investment seeks to measure different metrics from the welfare based approach upon which webTAG is based. The techniques and evidence to estimate GVA are still evolving and there is no standard approach. Different methods will have different requirements in terms of modelling effort. Evidence to date suggests they might produce a wide range of expected results.

1.3 Transport Investment as a means of unlocking other benefits

The Strategic Cases for transport investment, particularly large-scale infrastructure investment have been increasingly based on transport as the mechanism for delivery of other outcomes, i.e. employment growth, regeneration and housing and unlocking development land.

The DfT has undertaken work to understand and review the methods for capturing these measures in Strategic Cases¹² and to ensure the economic appraisal approach supports the Strategic Case for investment this is part of the ongoing evolution and refinement of the Transport Appraisal Guidance.

There are two areas where the webTAG economic case approach diverges from a broader GVA measure of economic impact. Firstly in the measurement of the impact of land-use changes that are forecast to be generated by the connectivity improvements of the transport investment scheme. Technical economic measurement issues make this estimation difficult, although recent webTAG guidance on dependent development attempts to partially address this in relation to housing development, by considering the net gain in value of the land.

In accordance with the Transport Appraisal Guidance (TAG) housing development can only be considered as part of the case for the investment if the development is dependent on the transport intervention being considered. If not then the intervention needs to be considered solely on transport grounds. Defined as dependent development, new housing associated with the scheme is dependent development if, with the new housing, but in the absence of any transport scheme, the transport network would not provide a "reasonable level of service" to existing and/or new users. There is no precise definition of reasonable level of service, however, if additional traffic can be accommodated by the network without significant increases in the costs of travel for existing users, then the network can be¹³ assumed to be providing a reasonable level of service.

¹¹ The "rule of a half" applies to generated or suppressed trips. Economic theory suggests that when consumers change their travel in response to a financial incentive, the net consumer surplus averages half of their price change. This takes into account total changes in financial costs, travel time, convenience and mobility as perceived by consumers.

¹² Such as Assessment of Methods for Modelling and Appraisal of the Sub-National, Regional and Local Economy Impacts of Transport, Report to the Department for Transport, MVA, September 2013

¹³ TAG UNIT A2.3, Transport Appraisal in the Context of Dependent Development, Department for Transport

The quantification of benefit is then made up of the planning gain measured by the increase in land value over the previous use value. Deducted from this is the cost to other road users in the scenario with the new transport infrastructure, including any infrastructure funded by the developer, and imposed by the traffic generated by the new development. These costs can be derived from the transport model, run with the new scheme included in both the case with and without the housing and developer funded infrastructure.

The benefits of dependent development are not added to the webTAG estimates of scheme benefits, perhaps because of uncertainty about the methods of valuing these impacts and understanding their full effects. The process for reporting the benefits of development gain is set out in webTAG 2-3. It notes that estimates of the value of development gain should not be included in the quantified assessment of costs and benefits but should be reported separately. While the benefits of dependent development do not therefore affect the BCR, the guidance provides a table which allocates scores (from largely beneficial, through moderate and slight to neutral, with a similar scale for adverse impacts). The scores are determined by the magnitude of the quantified net benefits and play a role in the decision about the value for money category into which a scheme falls. Non-monetised value is recommended as an output from this process, merely a qualitative impact score based on the scale of the expected impact, together with an estimate of the number of additional housing units unlocked. This is because not all of the development impact can necessarily be attributed to the transport investment.

The impacts on appraisal outcomes are likely to be more significant where the key objectives of the investment are to stimulate additional housing and employment regeneration. But the extent to which additional housing and job impacts are net additions to GVA is not straightforward. The DfT's starting assumption is that they should be measured as a redistributive impact. However, where labour supply is a constraint to economic activity in more productive locations, additional housing may be expected to lead to net GVA gains.

There are further GVA impacts that are not necessarily additive to transport benefits. These include:

- employment and productivity gains that otherwise would take place abroad; and
- increased labour market participation.

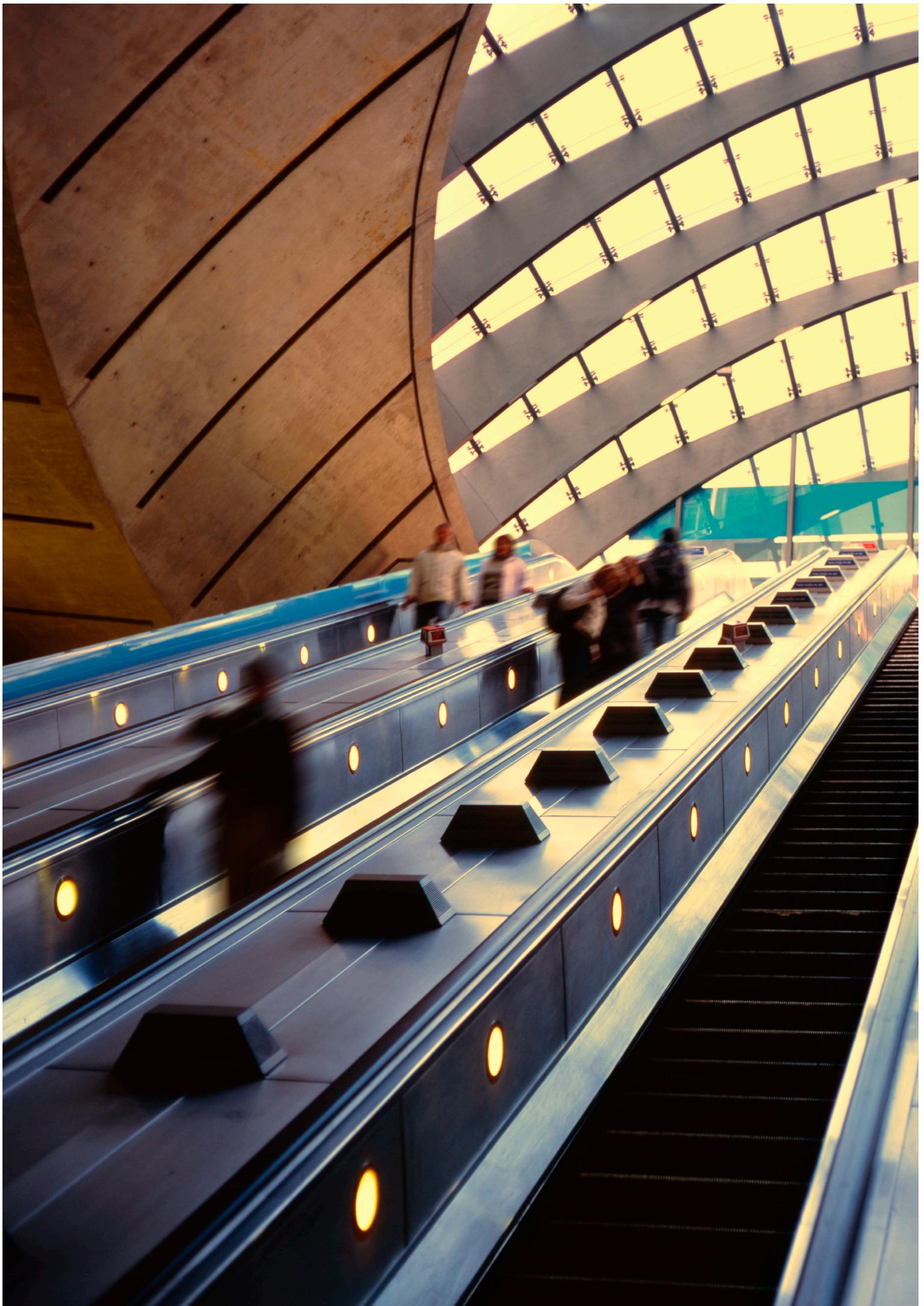
GVA gains are driven by behaviour change, in terms of the generation or relocation of jobs and/or home location. There is some evidence that large schemes are more likely to bring about the scale of impact that leads to this behaviour change.

So for large schemes there is value in presenting an exhaustive set of impacts – GVA, regeneration and transport impacts – within an economic appraisal. Each provides decision makers with complementary evidence on the economic outcomes of the investment, both in quantity and in location. Given the constraints of modelling approaches and of a consensus on the best way to measure all these impacts – particularly GVA – it is not yet possible to define an approach that allows a standard method for combining these impacts.

WebTAG guidance is currently under review in relation to wider economic impacts. This is in response to the Transport Investment and Economic Performance (TIEP) research previously commissioned by the DfT.¹⁴

There may be value in extending the scope of dependent development analysis to incorporate employment as well as housing impacts. For large transport investment schemes, the significant job and productivity impacts are likely to accrue through the intensification of activity within cities. The scope of this guidance could incorporate such impacts in addition to those which result from the opening up of new land for employment. This could help improve the economic case for large scale investment schemes.

¹⁴Transport investment and economic performance: Implications for project appraisal, Anthony J. Venables, James Laird, Henry Overman, 2014



2

The case for transport investment in London

2.1 The evidence : London's key challenges and strategic drivers

2.2 Summary

2.1 The evidence: London's key challenges and strategic drivers

London's key challenges and strategic drivers are well researched and documented. The GLA and TfL maintain a suite of documents including the London Plan and Mayor's Transport Strategy which provide the summary of, and evidence for, London's strategic drivers. These factors are also regularly and fairly widely critiqued by think-tanks and other groups but, as the responses to the National Infrastructure Commission's call for evidence suggest, the underlying key challenges and strategic drivers are roundly agreed upon by all major stakeholders and industry professionals.

London's Economic Impact

In 2014, London's total nominal GVA was £364 billion¹⁵, which is around 20 percent of the UK's total GVA, with the South East contributing a further 15 percent. Over the five years from 2009 to 2014, London's economy grew by 29 percent¹⁶. London has the highest GVA per head (in 2014 £42,666 per head, the English average being £25,367 per head¹⁷). The London Borough of Tower Hamlets has had the highest annual growth of local areas in the UK with GVA per head increasing by almost 10 percent.

Inner London¹⁹ produces 95 percent of London's GVA in the financial and insurance industry, and over three-quarters of its GVA in the professional, scientific and technical activities; information and communication; and real estate industries²⁰. Outer London accounted for over three-fifths of London's GVA in three industries (transportation and storage, construction, and manufacturing).

London's economy is diverse which contributes to its global competitiveness, its growth and resilience. London is, of course, the UK seat of government, with many associated civil service and public administration departments; it is a global centre of finance; it has world class institutions in higher education, entertainment, culture and the arts. As a world leader in financial services, technology and media, it hosts a large number of company global headquarters. It is connected by high speed rail to Paris and Brussels and has the world's second busiest international airport. It hosts the nation's busiest airport in terms of air freight and has a major new container port (London Gateway). It is a major international tourist centre. Its nearest global competitor in terms of strength in depth across a diverse set of economic pillars is New York, as shown in Figure 2.2. The densest and most highly paid districts in the UK are all in London where there is a high concentration of private sector knowledge-intensive jobs²¹. Figure 2.3 shows the employment density across different areas within London as well as the other UK Cities (there may however be correlations with the skills availability which is not reflected in the graph).



Figure 2.1: GVA per head by UK region (workplace based, 2014)
Source: ONS¹⁸

¹⁵ State of London's economy, trade and London's specialisation, GLA economics, 2016

¹⁶ London leads UK cities, Office of National Statistics, December 2015

¹⁷ Regional Gross Value Added (income approach), 1997 to 2014, Office of National Statistics, December 2015

¹⁸ Regional and local economic growth statistics briefing paper, Number 05795, 11 December 2015

¹⁹ Inner London being the boroughs of Camden, City of London, Greenwich, Hackney, Hammersmith and Fulham, Islington, Kensington and Chelsea, Lambeth, Lewisham, Southwark, Tower Hamlets, Wandsworth, Westminster

²⁰ Regional and sub-regional GVA estimates for London, Office of National Statistics, December 2011

²¹ Investing in City Regions, Volterra, November 2014

City	Financial Services (depth of offer)	Technology & media (Tech, media, creative)	National Government (Capital city/ administrative)	Higher education (University rankings)	Culture & the arts (theatre, music & art)	Global tourism (Number of tourist arrivals)	Logistics (Major ports, transportation)
London	Dark Orange	Dark Orange	Dark Orange	Dark Orange	Dark Orange	Dark Orange	Dark Orange
Hong Kong	Dark Orange	Dark Orange	Dark Orange	Dark Orange	Dark Orange	Dark Orange	Dark Orange
Singapore	Dark Orange	Dark Orange	Dark Orange	Dark Orange	Dark Orange	Dark Orange	Dark Orange
New York	Dark Orange	Dark Orange	Light Orange	Dark Orange	Dark Orange	Dark Orange	Dark Orange
Tokyo	Dark Orange	Dark Orange	Dark Orange	Dark Orange	Dark Orange	Dark Orange	Dark Orange
Paris	Dark Orange	Dark Orange	Dark Orange	Dark Orange	Dark Orange	Dark Orange	Dark Orange
Shanghai	Dark Orange	Dark Orange	Light Orange	Dark Orange	Dark Orange	Dark Orange	Dark Orange
Berlin	Light Orange	Dark Orange	Dark Orange	Dark Orange	Dark Orange	Dark Orange	Dark Orange
Dubai	Dark Orange	Dark Orange	Light Orange	Dark Orange	Light Orange	Dark Orange	Dark Orange
Sydney	Dark Orange	Dark Orange	Light Orange	Dark Orange	Dark Orange	Dark Orange	Dark Orange

Figure 2.2: Savills Polymath cities Index
Source: Savills²²

Strength & Specialism Not a strength & Specialism

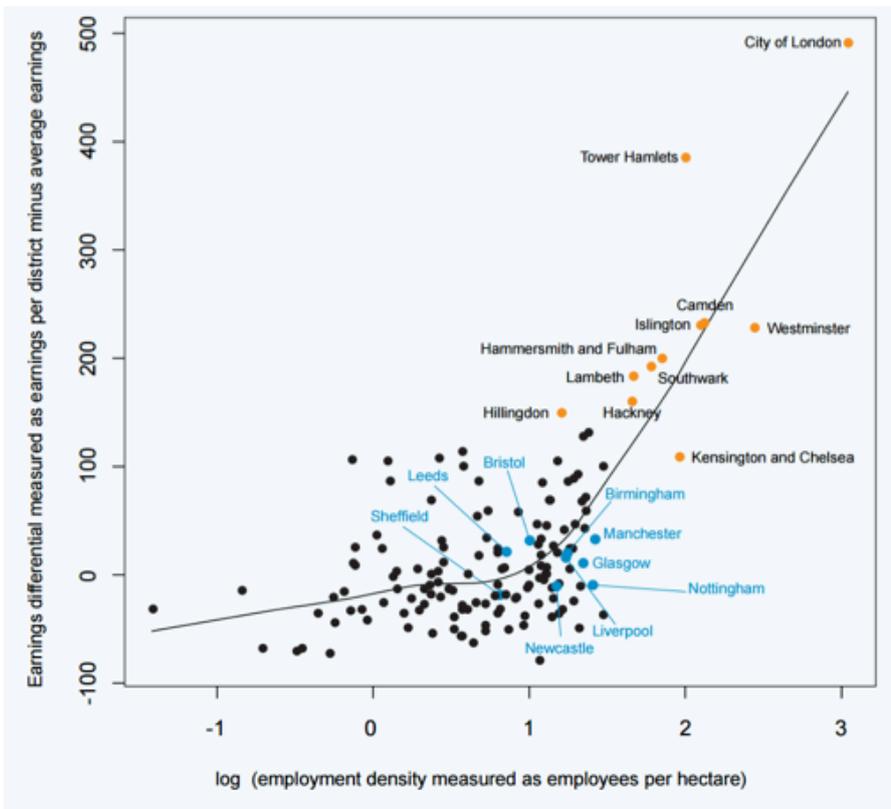


Figure 2.3: Employment density against earnings differential: 2008 to 2012 average
Source: Investing in City Regions, Volterra, November 2014

²² The World and London, global powerhouse An in-depth investigation into what makes London real estate so investable on the world stage, Savills World Research 2015

Employment Growth

London has seen significant growth in employment, from a low point of 3.8 million jobs in 1993, to 4.8 million by 2011. This has been accompanied by major structural shifts away from manufacturing towards services. The Further Alterations to the London Plan (FALP) forecasts growth to 5.8 million jobs in London by 2036. Recent growth has however been very strong, which means that that by 2013 the forecast of 5.2 million by 2021 had already been reached. Recent work by Oxford Economics suggests that even the revised forecast may not be high enough, and that the London Infrastructure Plan forecast of 6.3 million jobs by 2050 could be surpassed as early as 2026²³.

The FALP sets out forecasts of both office based employment growth and demand for office floor space. Between 2011 and 2031 total office based employment is forecast to grow by 303,000 jobs, of which 177,000 (58 percent) is forecast to be in London's Central Activities Zone (CAZ)²⁴ and north of the Isle of Dogs. London's forecast net additional floor space is 3.93 million square metres over this period, of which 3.07 million square metres (59 percent) is forecast in the CAZ.

TfL employment forecasts, Figure 2.4, show the change in employment growth²⁵ is mostly expected on the eastern side of London and mostly concentrated in the boroughs of Tower Hamlets and Newham. There is therefore expected to be a strong draw in terms of the growth of future jobs to the eastern side of London. It should be noted that Figure 2.4 does not reflect any impact of Crossrail 2 which may support greater intensification in areas along the route, as well as potentially land use changes.

Population Growth

In every year since 1988, London's population has grown, including through the economic downturn of the early 1990s. The scale and pace of population growth in London is much greater than previously envisaged. The original London Plan set out forecast population of 7.8 million by 2011 for which the census of that year identified a population of 8.2 million. The revised population projections set out in the FALP forecast London's population rising from 8.2 million in 2011 to 10.1 million in 2036.

Further projections that have been prepared by the GLA to support the Mayor of London's 2050 Infrastructure Plan show a central forecast for 2050 of 11.3 million. The same study by Oxford Economics noted above suggests that by 2050 London's population will be over 12 million²⁶. The population growth predicted as shown in Figure 2.5 does not reflect any densification and land use changes that Crossrail 2 may support in areas along the route.

90 percent of the people who work in central London (who live either in the city centre, suburbs or hinterland) use public transport, walk or cycle to work²⁷. This has an impact on where people choose to live in London.

²³ Future Proofing London: Our world city: risks and opportunities for London's competitive advantage to 2050, Atkins Oxford Economics and Centre for London, 2015

²⁴ The Central Activities Zone broadly being the West End, the City of London and Nine Elms corridor and shown in Figure 3.4

²⁵ is a change in growth and therefore relative to current baseline employment level

²⁶ Future Proofing London: Our world city: risks and opportunities for London's competitive advantage to 2050, Atkins Oxford Economics and Centre for London, 2015

²⁷ Urban demographics, Why people live where they do, Centre for Cities, November 2015

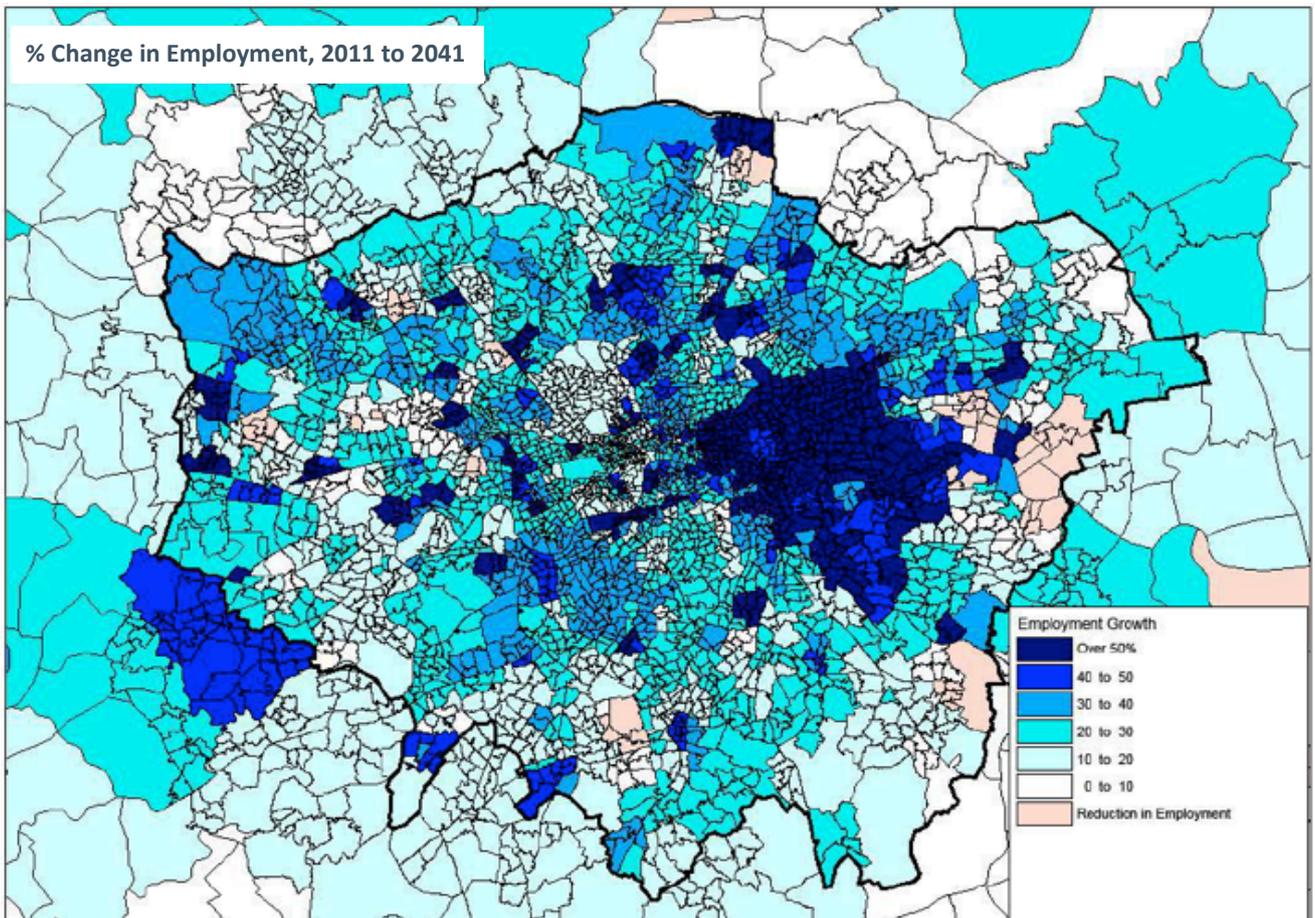


Figure 2.4: Forecast employment growth, 2011 to 2041
 Source: TfL, Crossrail 2 Business Case, 2015

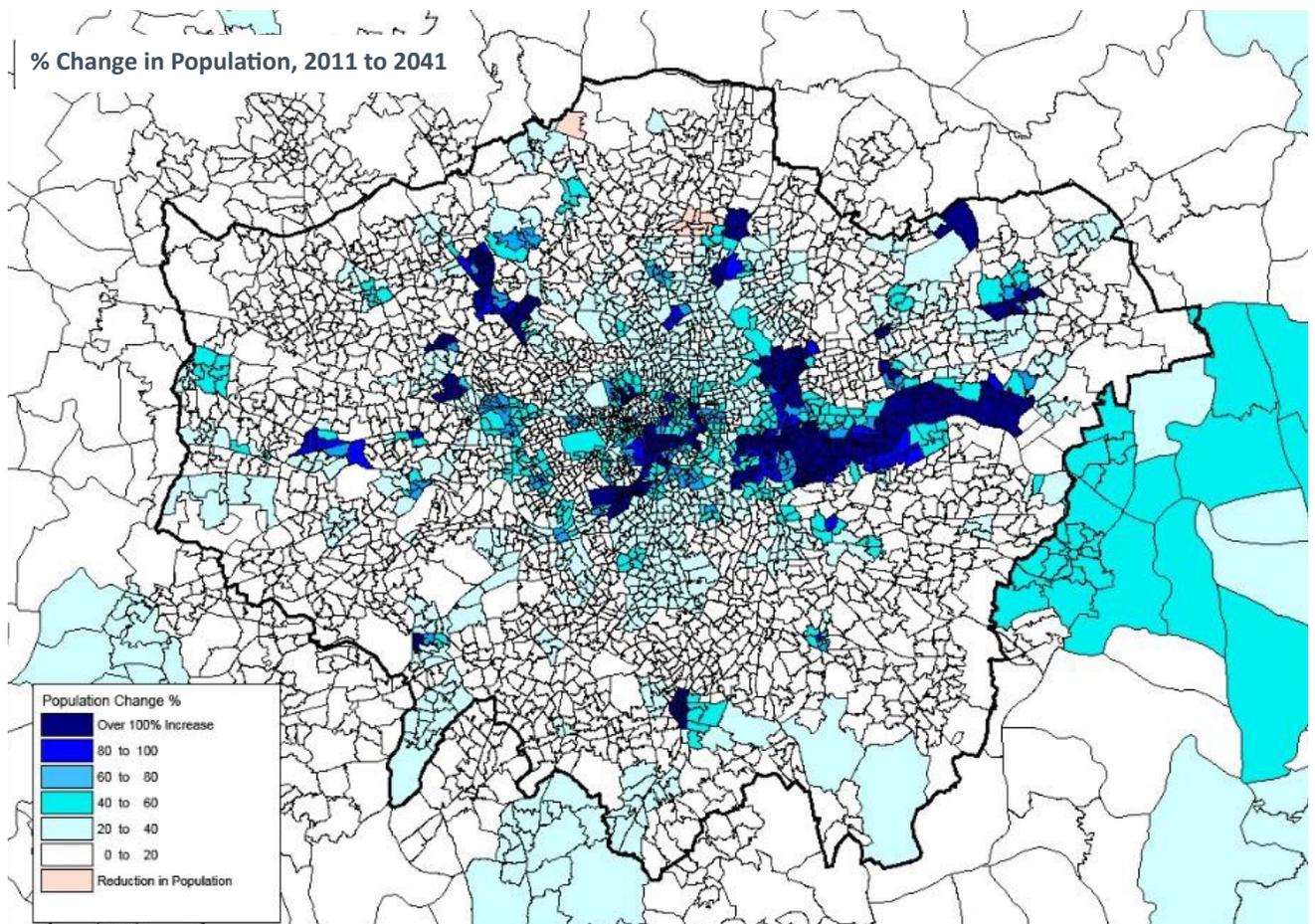


Figure 2.5: Forecast population changes, 2011 to 2041
 Source: TfL, Crossrail 2 Business Case, 2015

Access to public transport, along with housing affordability, are much more frequently chosen reasons by Londoners for why they chose to live where they do than elsewhere in Britain as shown in figure 2.6. This is because of access to work, culture and leisure facilities and that the selection of place to live is likely to reflect respondents' prioritisation of proximity to public transport over proximity to work²⁷.

Jobs in London are taken up by London residents and by in-commuters from the areas around Greater London.

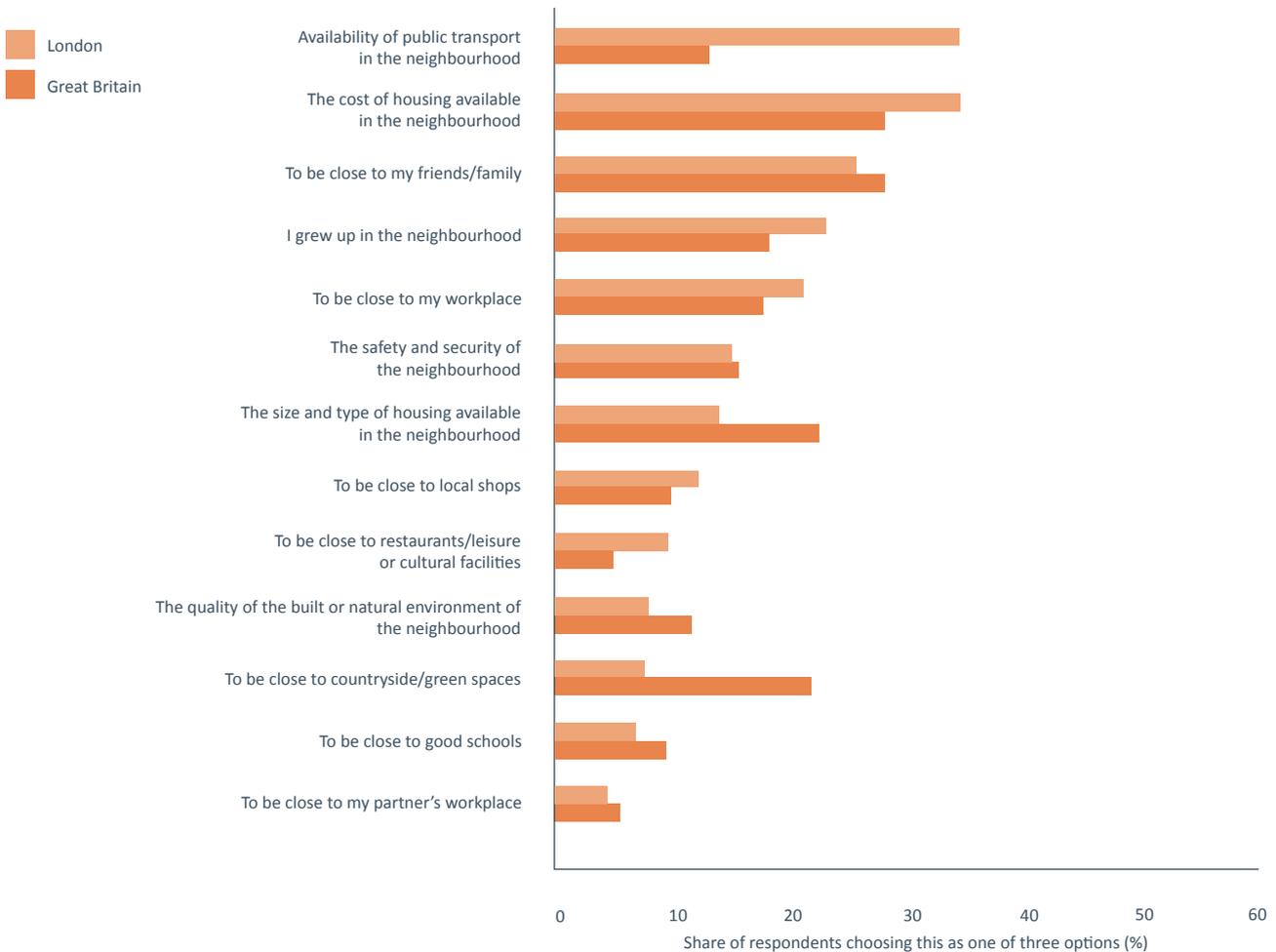


Figure 2.6: The main reasons why Londoners choose to live in their neighbourhood
 Source: Future Proofing London: Our world city: risks and opportunities for London's competitive advantage to 2050, Atkins Oxford Economics and Centre for London, 2015

²⁸ Ibid

Figure 2.7 shows the geographic area where at least 1 percent of the population commute to London. There is also an element of outwards commuting from inside Greater London to jobs outside Greater London. In 2011, about 800,000 people commuted into London on an average day from areas outside. Out-commuting (commuting from inside to outside Greater London) was much less, at an estimated 350,000 people per day²⁹.

TfL forecasts that the overall pattern is expected to remain similar to the present. In-commuting is expected to increase in proportion to employment growth, with 900,000 in-commuters expected daily in 2031. Although the major share of new jobs will be taken up by London residents, it is clear that longer-distance commuting will continue to present transport capacity challenges that extend beyond the GLA area and particularly affect the national rail network³⁰.

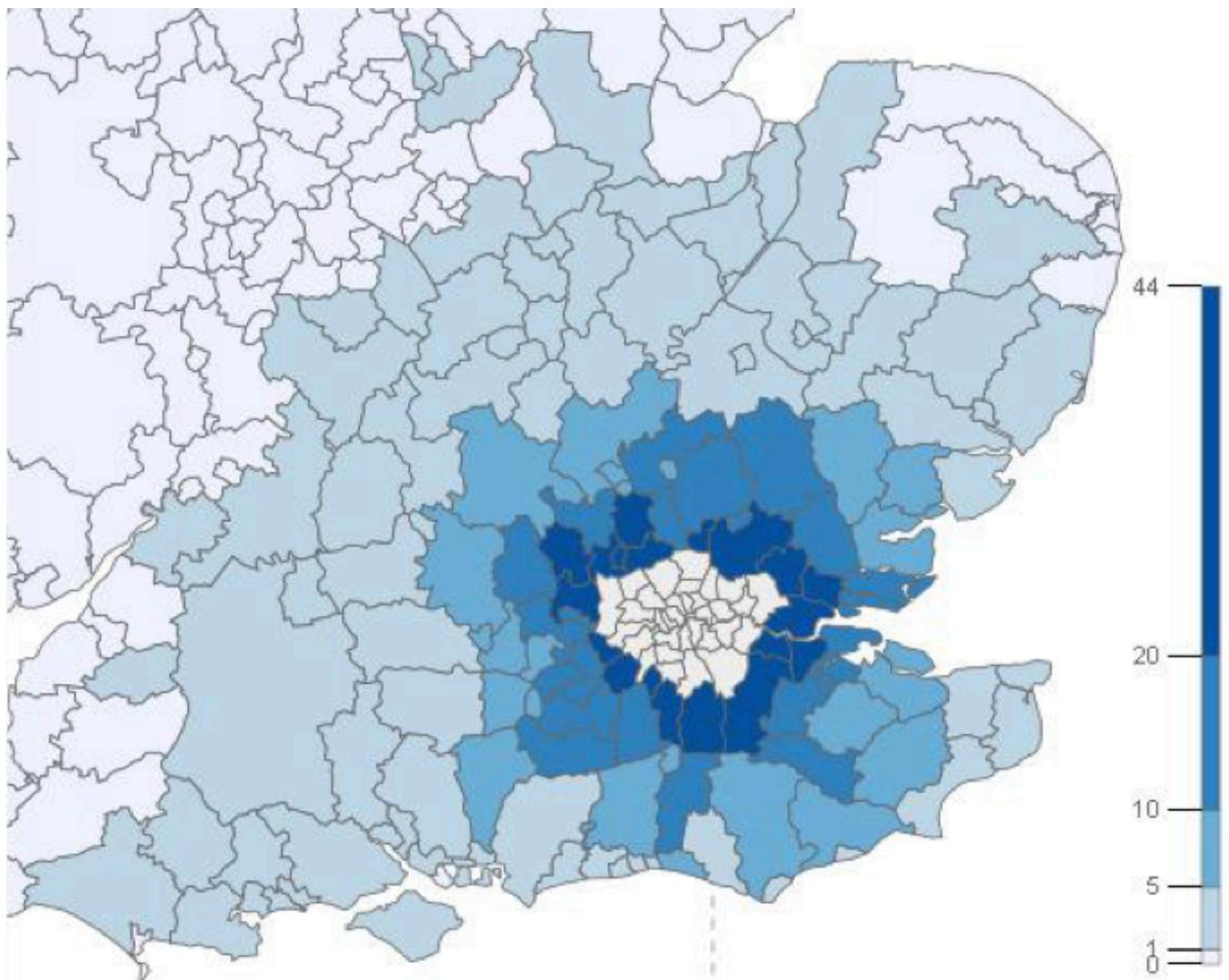


Figure 2.7: Counties that have residents that commute to London
 Source: Commuting patterns in the UK, Office of National Statistics, 2011

²⁹ Travel in London Report 8, Transport for London, 2015
³⁰ Travel in London Report 8, Transport for London, 2015

Demand for Transport

Over the last 15 years, total trips within London have increased by 18 percent, with increases of 70 percent in rail trips and 72 percent in bus trips. From 2008, total travel demand has grown by 9.2 percent in terms of journey stages and 8.2 percent in terms of trips. This is broadly in line with population growth over the same period (i.e the Mayor’s Transport Plan). However, demand for public transport, particularly national rail and London Underground has far exceeded expected forecasts, both experiencing high levels of growth, and at much higher levels than population increases, as shown in Figure 2.8. This is because the road network is operating at capacity, with very low (and slightly declining) operating speeds for private car use. National rail and London Underground networks therefore have to play an increasing role as growth is accommodated in the years ahead. However, the national rail network is already under pressure at peak times.

Key pressure points are at and around the central London terminals. Waterloo and Victoria stations serve the largest number of passengers. However, along with Euston and Marylebone, these stations are not served by any cross-London suburban railways nor are they located in the heart of the West End or City of London, two key employment areas.

About 47 percent of national rail passengers transfer to London Underground or Docklands Light Railway (DLR) services on arrival at the their central London rail terminus³¹. This demonstrates the pressure on interchange routes at these national rail termini and the fact for many, onward journeys by public transport are required. It is expected that some onwards journeys within walking distance may be required, but for London Waterloo for example, many of the onward journeys are by non-walk modes, adding demand to the network as shown in Figure 2.9.

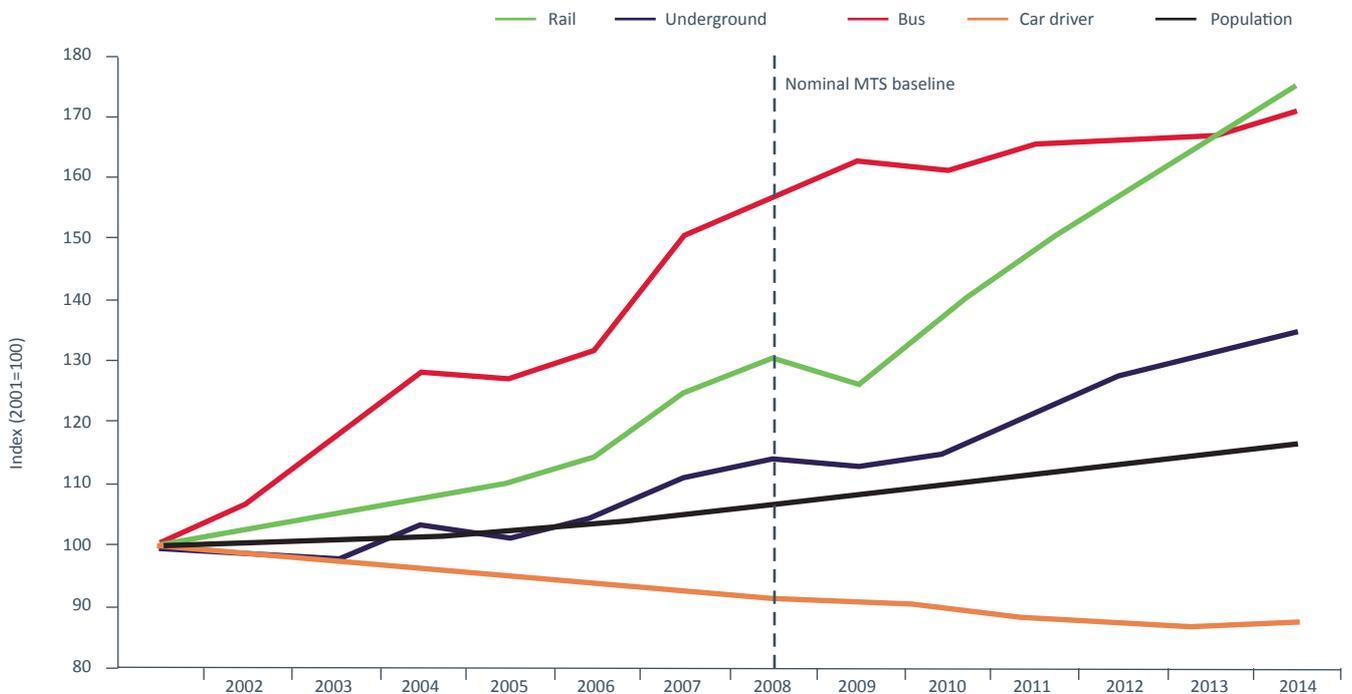


Figure 2.8: Growth in journey stages on selected modes, 2001 to 2014
 Source: Central area peak cordon survey, Transport for London, January 2014

³¹ Central Area Peak Cordon survey, Transport for London, January 2014
³² London Infrastructure Plan 2050, A Consultation, Mayor of London, 2014

TfL forecasts that demand for public transport is likely to increase by 50 percent between 2015 and 2050, with travel on national rail and London Underground networks likely to increase by 60 to 80 percent over the same period³². This is an unprecedented level of forecast increase.

One of the most effective ways of addressing a situation in which it is both the London Underground and the suburban rail network that are forecast to be under pressure is to connect London termini. This frees up space at the terminus stations (one re-use of which might then be the accommodation of more longer distance services – the model followed at Gare du Nord Paris, where RER services (regional express cross-Paris services) pass through the station at basement level).

It also eliminates down-time for the train-fleets (and crews) at terminus turnarounds, so improving rail service economics. Cross-London links also provide wider cross-connectivity for journeys to work, expanding labour market catchment areas, as well as removing time-consuming and frustrating interchanges for passengers. Other investments can bring some, but not all of these benefits.

Crossrail and Thameslink follow this model and London’s thirteen central area termini offer scope for more cross-linking. Figure 2.10 shows the number of passengers using the national rail termini at present and the huge onward dispersal challenge that could be addressed through connecting some of these termini. As well as potentially delivering passengers to their destination, cross-London links can help to provide additional travel options, relieving pressure on key London Underground links.

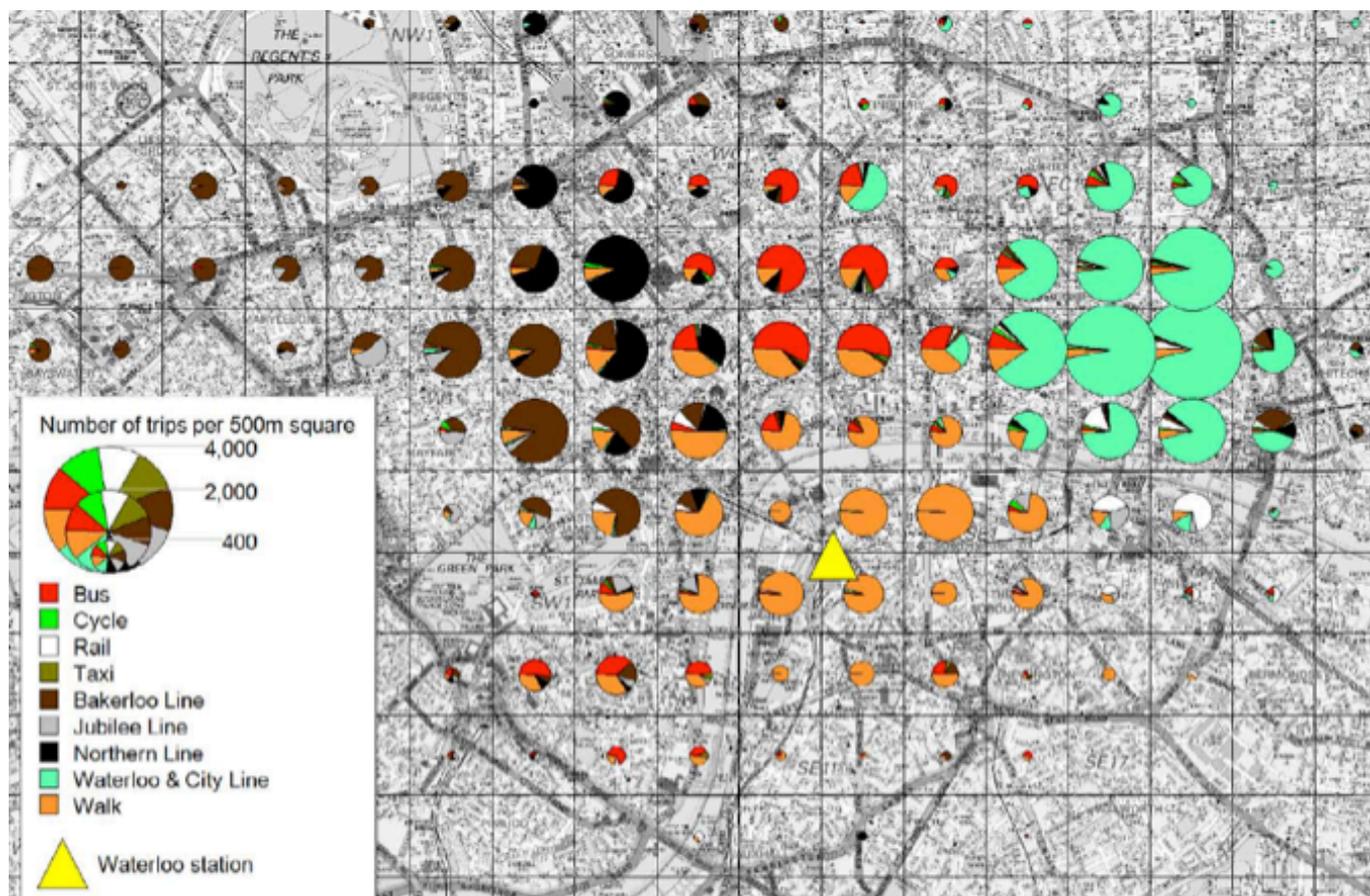


Figure 2.9: Onward modes of AM peak national rail arrivals at Waterloo station by final trip destination
Source: TfL, Central London Rail Termini Report, 2011

³² London Infrastructure Plan 2050, A Consultation, Mayor of London, 2014

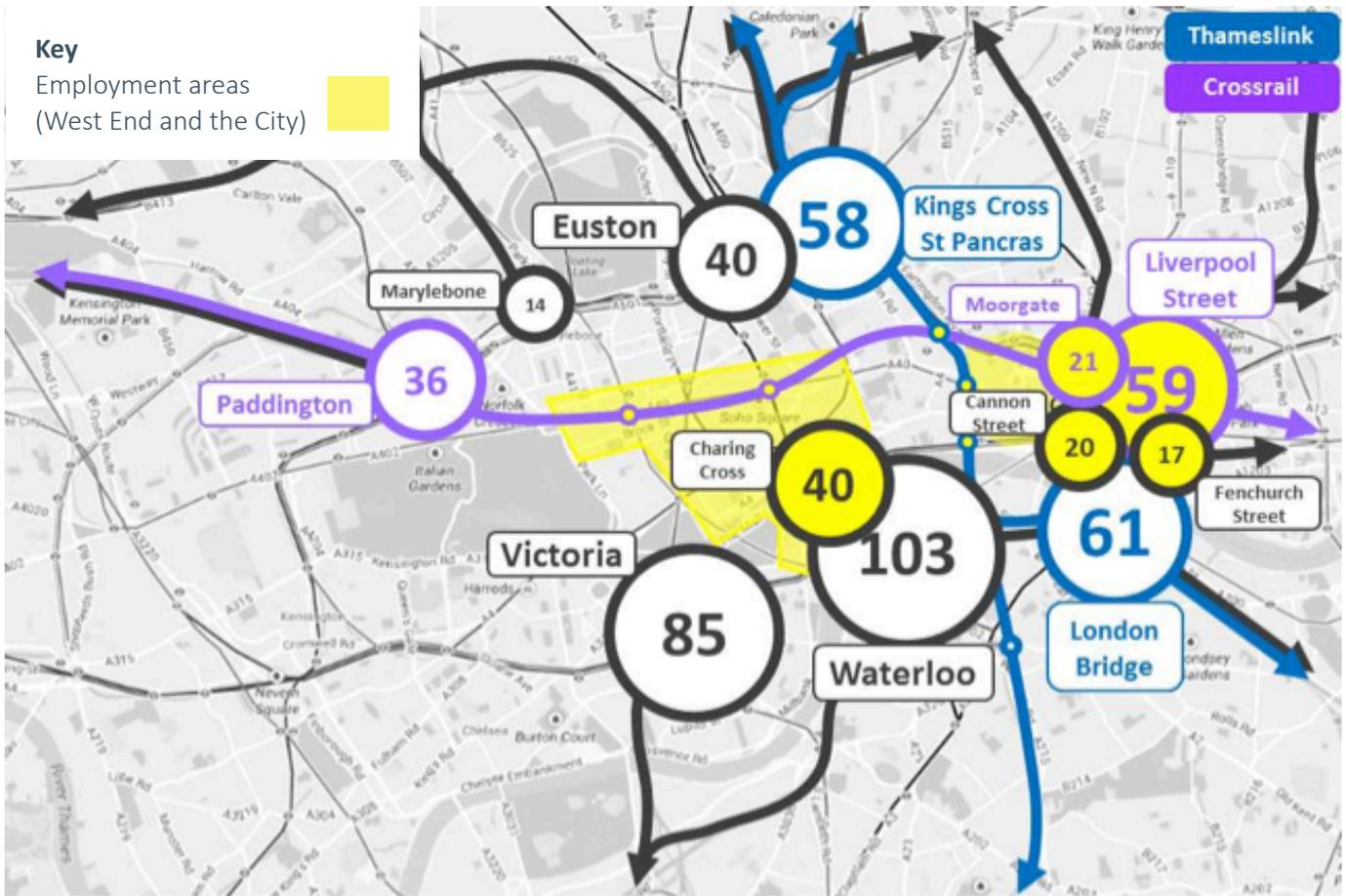


Figure 2.10: Annual number of rail passengers at Central London termini stations (millions 2014/2015)
 Source: Estimates at Station Usage 2014-2015, Office of Rail and Road, 2015

2.2 Summary

Jobs in London have a high economic value for the UK economy. Employment and population growth in London is happening on an unprecedented scale. London will be larger than in any time in its history. The demand for London Underground and national rail travel is likely to increase by 60 to 80 percent by 2050. Cross linking services between pairs of existing central London terminals potentially represents an efficient way of addressing growth needs.

To date, growth in both employment and population has been under-forecast with investment plans then being based on those lower forecasts. The current Mayor’s Transport Strategy, which is the basis of the current investment programme, is based on growth assumptions far lower than those that have actually occurred during that period (since 2010).

The London Infrastructure Plan 2050 is now based on higher projections but the infrastructure investments proposed are still at the planning stage. Even if there was a significant shift in economic patterns or public policy directing investment or activity away from London, there is little risk that significant investment in expanding London’s rail network capacity would be wasted: the scale of growth is unprecedented, reflecting the city’s continuing prosperity.

Case Study - Paris

Although Paris has had a comprehensive metro system since 1900, realising the importance of Cross-city links, the RER (Réseau Express Régional) network was developed in the 1970s. This provides links across the city with fewer stops than the metro system (the average distance between stations is four times that of metro stations) enabling faster journey times. The RER services have helped to support the existing metro system by adding capacity but also reducing the need for interchange. Paris has used its RER network to supplement its existing metro, whilst also bringing in passengers from further away at distances unviable on the metro network.

Overlaying the map of the RER on London demonstrates the large area that the RER covers and the ability this has to provide a large labour market to the City Centre of Paris.

London's Crossrail and Thameslink lines work in this way, but Paris has shown that having a network of Cross-city lines, such as their five RER lines, can be beneficial in increasing the available labour market for a City.

In addition to growth within the Central Activity Zone, Paris has developed multiple employment hubs. Such cross-city lines may have played a part in the development of these in the same way that Crossrail 2 should unlock development potential in Upper Lea Valley Opportunity Area.

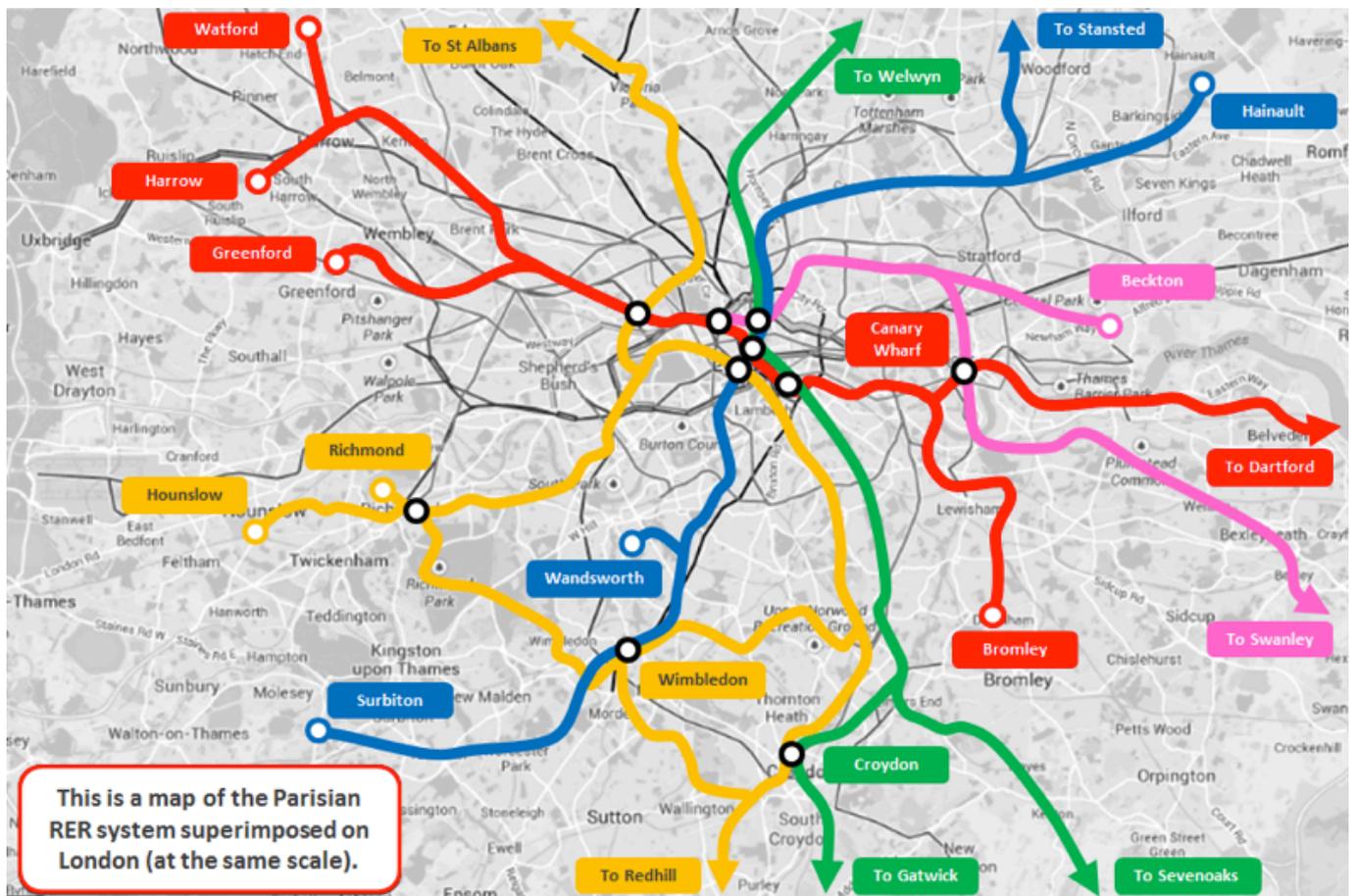


Figure 1: Paris RER network superimposed onto London



3 Large scale public transport infrastructure development

3.1 Introduction

3.2 Current investment proposals

3.3 Transport investment options

3.4 Crossrail 2

3.5 Other alternatives to address the identified network gaps and opportunities

3.6 Regional transport investments

3.7 Possible refinements to Crossrail 2

3.8 Reviewing the Crossrail 2 case

3.9 Summary

3.1 Introduction

London benefits from a clear spatial planning framework, the London Plan, within which sits the associated infrastructure needs – the Mayor’s Transport Strategy and the London 2050 Infrastructure Plan. These documents clearly set out the transport infrastructure investment that is felt to be needed by the Mayor and TfL, along with justification for such, principally the rapid ongoing and forecast growth in London.

3.2 Current Investment Proposals

There is in place a substantial programme to increase the capacity of the London Underground, with new train fleets, station upgrades and, by means of new train control systems, higher service frequencies. This includes maximising the capacity of the London Underground: increasing train frequencies to up to 36 to 38 trains per hour across the Jubilee, Piccadilly and Northern lines with complementary investment in station capacity along those routes is also required.

The value of current investment proposals is significant, examples being:

- £5.54 billion in modernisation of the sub-surface Underground lines including new trains and signalling;
- £500 million on the Victoria Station Capacity Upgrade;
- £563 million on the Bank Station Capacity Upgrade;
- £400 million on the Northern Line Upgrade;
- £321 million on the London Overground Capacity Improvement Programme; and
- £260 million on new trains for London Overground services Liverpool Street to Chingford, Cheshunt and Enfield, as well as the Barking to Gospel Oak line and the Romford to Upminster service.

In addition, coming on-stream fully by 2020 will be the completion of Crossrail 1 (£15 billion) and Thameslink (£6.5 billion) – two high capacity regional express routes, running east-west and north-south across the central area and beyond into the surrounding shire counties. These two new routes will bring much needed connectivity improvements – for instance to Heathrow, Canary Wharf, the West End, the City and key development areas such as Stratford and Old Oak.

London Underground’s extension of the Northern line is under construction and will help broaden the accessibility map to newly regenerating areas in Battersea. An extension to the Bakerloo line is under development and if it goes ahead will help in a similar way in and south east London, but neither will add capacity to the core central activity zone. The success of the new orbital railway fashioned into the London Overground is partly measured in the growth in popularity of new areas of employment growth in inner north and east London.

The programme of investment³³ for both line and station upgrades on the London Underground and Overground is shown in Figure 3.1 and Figure 3.2 respectively.

Current investment³⁴, however, is not keeping pace with growth. The Mayor’s current Transport Strategy was based on a daytime London population expectation of 4.7 per cent growth between 2008 and 2014 when the daytime population, which includes non-resident commuters and visitors, has in fact grown by 9.6 percent. In terms of public transport, the increase in travel demand in terms of trips has been 17.6 percent, compared to an expectation of 4.6 percent, with a 10 percent shift in net mode share towards public transport, walking and cycling since 2000.

Between 2031 and 2041 it is expected that demand in London will be such that crowding on the network will have increased to levels seen in 2011, despite the array of committed investments³⁵. Overcrowding is one of the greatest barriers to disabled and older people travelling on the network³⁶ and there will be an additional 70 percent of over 80’s by 2035 in London compared with 2015.

³³ Fit for the Future Our plan for modernising London Underground, London Overground, Trams and the DLR, Transport for London

³⁴ TfL, Crossrail 2 Business Case, 2015

³⁶ Understanding the travel needs of London’s diverse communities, Transport for London, 2014

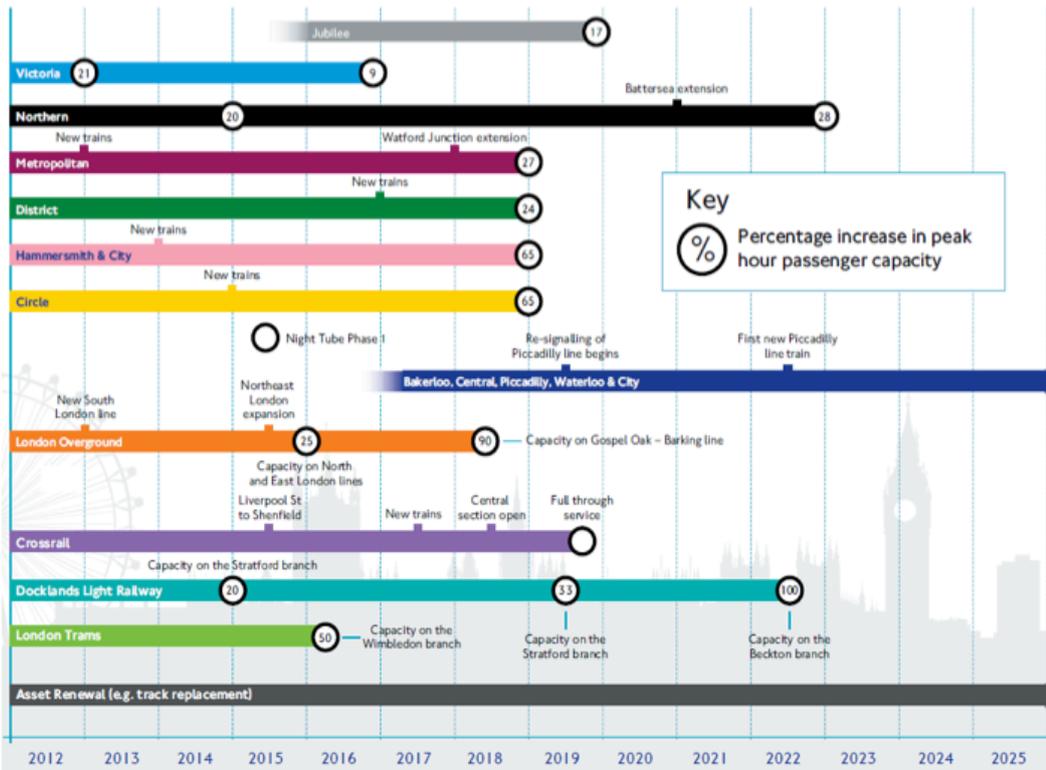


Figure 3.1: Programme of London Underground Investment – Line Modernisation
Source: Transport for London



Figure 3.2: Programme of London Underground Investment - Stations
Source: Transport for London

The continuing growth of London places strains on its transport system, which if not met, will result in a downward spiral of overcrowding, poor service reliability and congestion and additional costs for businesses and longer journeys for residents.

The capital’s rail network, comprising both London Underground and national rail (together with the DLR) is the only sustainable basis to meet the growth in travel demand arising from the projected population and employment forecasts.

Proposed Strategic Development and Transport

The London Plan identifies a series of Opportunity Areas. Opportunity Areas are London’s major source of brownfield land which have significant capacity for development – such as housing or commercial use - and existing or potentially improved public transport access. Typically they can accommodate at least 5,000 jobs, 2,500 new homes or a combination of the two, along with other supporting facilities and infrastructure. Also identified in the London Plan are Intensification Areas which are built up areas with good existing or potential public transport links and can support redevelopment at higher than existing densities. They have significant capacity for new jobs and homes but at a level below that which can be achieved in the Opportunity Areas. Figure 3.3 illustrates these development areas and also shows how they relate geographically to potential rail network developments.

This includes a Zone 3 orbital railway which has been cited by the Mayor of London as a potential scheme to link suburbs together and a potential extension of the Bakerloo Line in to the Opportunity Areas on the Old Kent Road and further south.

In total there are 38 Opportunity Areas and seven Intensification Areas. These cover almost 19,000 hectares of land, with the potential to deliver a minimum of 300,000 homes and over 500,000 jobs. The areas range widely in size and capacity. The Upper Lea Valley is the largest at 3,900 hectares, and covers four boroughs, the Lower Lea Valley has the greatest capacity for homes, with a minimum of 50,000 projected and the Isle of Dogs has the highest projected employment capacity, at 110,000 jobs³⁷.

The GLA forecasts that London’s transport system could require some £475 billion of capital investment (enhancements plus renewals) in the 35 year period to 2050³⁸.

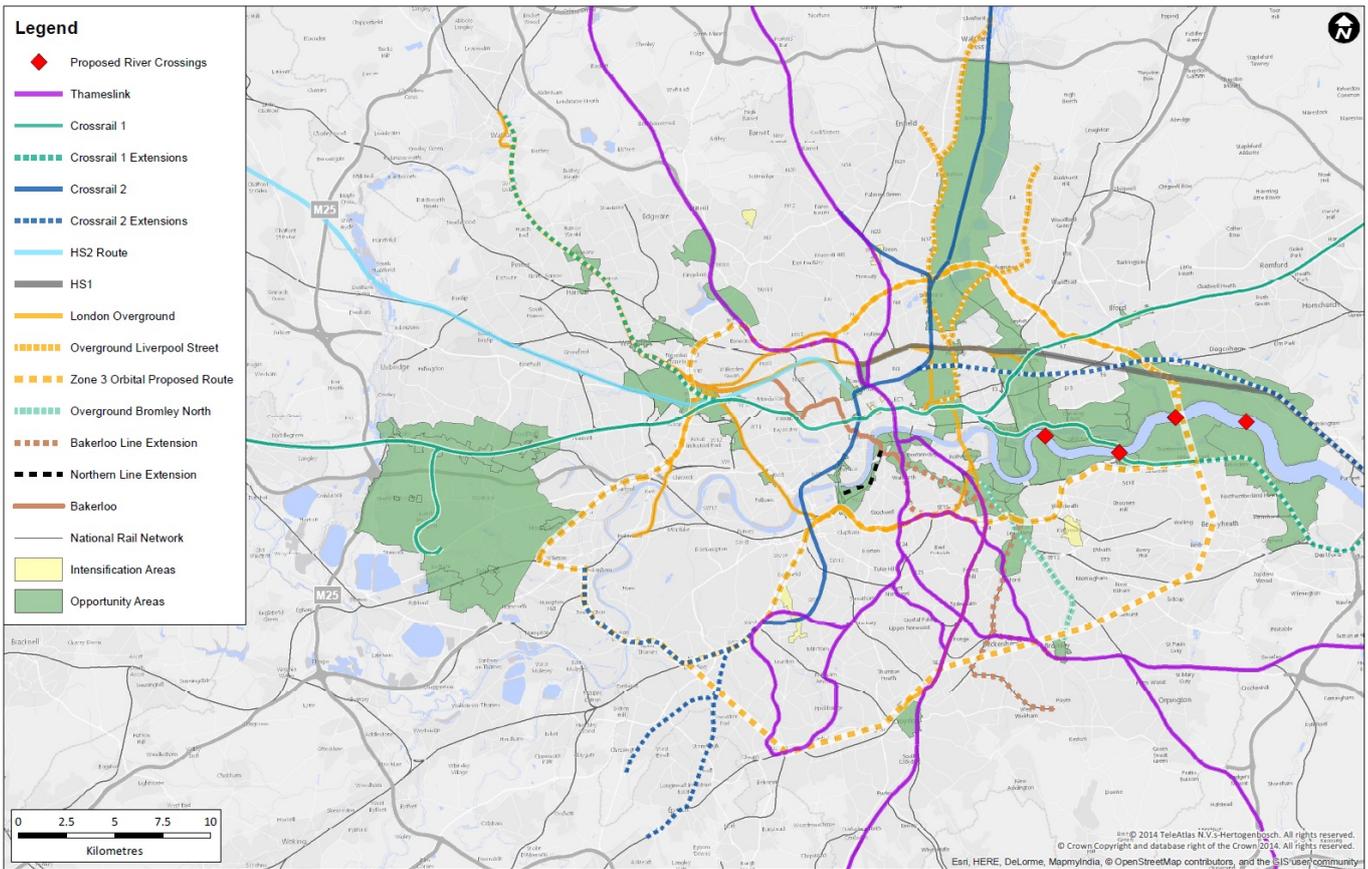


Figure 3.3: Opportunity Areas and Very Large Planned and Potential Transport Investments

³⁷ Opportunity Knocks: Piecing together London’s Opportunity Areas, London First
³⁸ The cost of London’s long-term infrastructure, GLA and Arup, July 2014

3.3 Transport Investment Options

The pace of demand growth is such that more capacity will be needed, beyond the levels that will be created by these existing plans.

The pressures are evident, in fairly equal measure, on the London Underground network and the national rail network on its approaches to central London. There are three key components to the capacity challenge:

- at and around the central London terminals;
- accessing the CAZ; and
- meeting the growth expected to the east side of London.

The first component affects both rail networks. The legacy of the Victorian period of infrastructure development left major national rail terminals at a boundary around the City/West End that creates operational inefficiencies and service limitations – and means that commuters face time-consuming train-to-train transfers in congested stations. One consequence is that major investment is needed at the terminals themselves. Crossrail 1 and Thameslink address these problems in a large measure for users of London Bridge, Paddington, St Pancras and (particularly) Liverpool Street. But the legacy boundary remains at Waterloo, Victoria and Euston (although major investment is underway at Victoria to help address this problem and is planned at Euston as a consequence of High Speed 2). It remains a key factor in the thinking of the current Crossrail 2 plan in regard to Waterloo in particular.

The second component pressure is the current CAZ, where many new jobs in London are expected, and which is so hugely important to the national economy. The existing CAZ as shown in Figure 3.4 will be ‘stretched’ both east and west, to embrace new Opportunity Areas.

The third component is the expected focus of growth in London towards the east. While there are some locations to the north/north-east, west and south where significant development is possible (the Upper Lea Valley, Willesden/Park Royal and Chessington being three examples of Opportunity Areas; the Wandle Valley at Earlsfield being an intensification area candidate), most of the potential for both residential and employment growth lies in developments to the east, both north and south of the Thames, with the London boroughs of Tower Hamlets and Newham likely to be the greatest focus. In the absence of rail investment, Opportunity Areas in East London may develop at a lower density, be less attractive for new housing and reflect uses that are encouraged by road access improvements, notably the river crossing proposals.



Figure 3.4: Central Activities Zone
Source: Central Activities Zone Supplementary Planning Guidance (SPG), draft 2015

For the London Underground network, these three components of demand pressure give rise to forecast congestion on the central parts of the Northern lines (both branches), the Victoria Line, Waterloo and City Line and the Jubilee Line, with more localised pressures arising on other lines including Central and Piccadilly and parts of the sub-surface lines. The capacity limitations for onward dispersal of passengers from London terminals is most notable from Waterloo (towards the City and Canary Wharf), from Victoria (to the West End) and from Euston (towards the City and West End). This is shown in Figure 3.5. For the national rail network, the overall effect is the prospect of serious overcrowding of the network on the main lines approaching Waterloo and Liverpool Street – and to a lesser extent on the routes leading towards Paddington and Victoria, as shown in Figure 3.5.

There are (as yet unfunded) plans to carry out works to ease congestion on both the Waterloo and Victoria routes, including the lengthening of peak services on all main suburban routes into Waterloo and full re-opening of Waterloo International Terminal to allow for service increases on the Windsor lines. However, trains have in general already been lengthened to the limits of the existing stations (and the London terminals in particular), for example 12-car Thameslink trains on the Brighton Mainline at peak times, and nothing is yet committed that would permit additional services to run. The delivery of more passengers into Waterloo also adds to the need for onward distribution of passengers on a congested underground network.

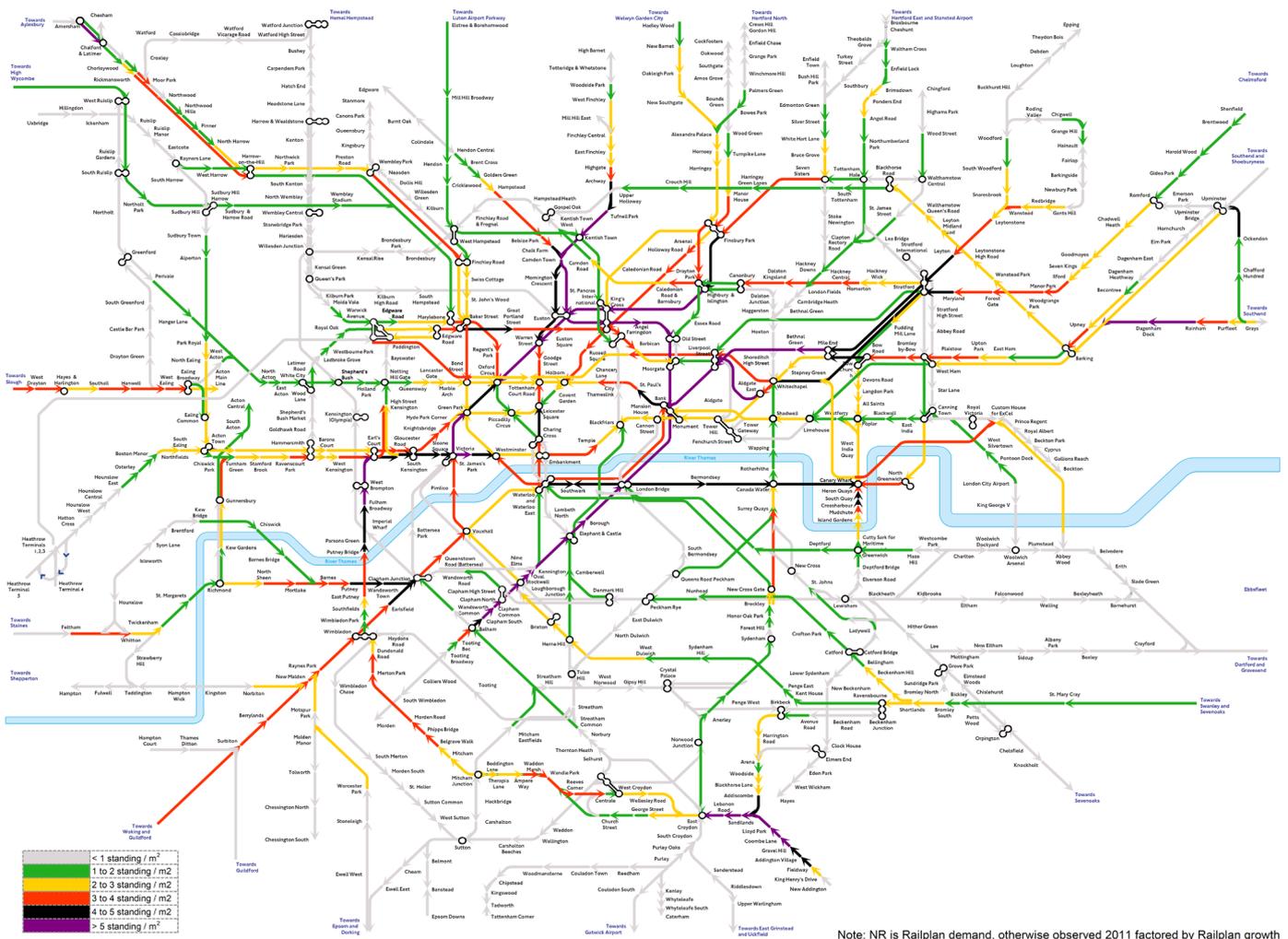


Figure 3.5: Predicted 2031 AM Peak Crowding Levels on Underground and National Rail network
Source: TfL, Crossrail 2 Business Case, 2015

So the position is complex and spreads over the geography of both rail networks. As well as responding to the three generic challenges in a way that addresses the weaknesses apparent at various parts of the network, there is the crucial opportunity to have investment create and release land value for additional housing. As noted in Section 4, these opportunities, besides stemming from a general presumption towards higher densities of housing in existing areas (a trend already apparent where national rail services offer good connectivity to the Central Activity Zone, both in Greater London and beyond), are located primarily in the eastern Thames gateway area and along the Upper Lea Valley.

It follows that there can be said to be multiple gaps in the transport infrastructure (existing and committed) when considered against the needs set out in the Mayor's Plan for London in 2050. No single transport intervention is capable of fulfilling all of these gaps.

The best response in terms of infrastructure investment will be a combination of the following types of measure:

- further cross-London links (of the Crossrail/ Thameslink style) because, well-directed, these can resolve multiple weaknesses (gaps) and bring an intrinsically more efficient operation (reduced need for multiple central London rolling stock turnarounds which are wasteful of platform capacity, and require larger train fleets and train crews);
- completion of the Underground and DLR line by line capacity uplifts and extensions, and implementation of measures to increase the capacity of the suburban national rail network, with metro-style trains and services where possible to support growth; and
- selected main radial route development of the national rail network – noting that large-scale capacity uplifts will rarely be justified by serving markets on a like-for-like basis (so connections to airports or national high-speed rail connections offer the best prospects).

In some circumstances, it will make sense to plan investments as a strategic development as they are in many cases interrelated. This is a change to most current practice.

In relation to cross-London links, the original plan for Crossrail 1 envisaged a tunnelled central section reaching the surface and the existing railways lines in as short a distance beyond Paddington and Liverpool Street as possible. Although the tunnelled section was to be extended further east so that the line could also serve Isle of Dogs, essentially the configuration does not add track capacity to the existing lines on the Great Western Mainline and Great Eastern Mainline, although it does relieve the two terminal stations (Paddington and Liverpool Street respectively) of large flows of interchanging passengers. When it comes to new cross-London lines, it may not be possible to keep the new build tunnelled sections so short both because of the implausibility of immediate underground to surface connections (for instance at Victoria) and/or because of the need to expand capacity of the national rail corridor approaching the terminus, potentially over a significant length.

There are choices to be made too in terms of operational concept. It is notable that whereas the Victoria Line, for example, using automated train control and operating as a free-standing system with no operational connections to other lines is capable of supporting a 36 trains per hour, the 'inner suburban' pair of tracks into Waterloo can only manage half that throughput – 18 trains per hour (in the morning peak period and 16 trains per hour in the evening peak). If capacity is the aim, segregation of operational routes that allows for automated train control systems (such as that already used on the DLR) and short headways would be the preferred approach. With properly designed conflict-free junctions, this lends itself to a trunk cross-Central Activities Zone line with multiple branches at either end, with lower frequencies on each branch.

It is against this backdrop that further investment in London's rail network needs to be judged.

3.4 Crossrail 2

Crossrail 2, Figure 3.7, was featured in the same study of 1988 that identified Crossrail 1 as a preferred investment (although both schemes have been substantially modified since). It has the advantage of having progressed through initial consultations and much of the route has been subject to statutory protection.

Against the set of ‘gaps’ and opportunities identified here, Crossrail 2 scores well, and in particular it:

- is a cross-London route connected into national rail lines at either end;
- relieves congestion and the need to interchange at Waterloo and Euston (and to a modest extent at Liverpool Street);
- relieves Victoria, Northern (Morden branch) and Piccadilly line congestion;
- provided that the 4km route between Wimbledon and New Malden is 6-tracked, creates a substantial uplift in the capacity of the South West Main Line into Waterloo, meaning additional capacity for services from Hampshire and Surrey (and indeed Dorset, Wiltshire and Devon) that are subject to excess demand over significant distances;
- provides direct access from SW London to the planned HS2 terminus at Euston; and
- facilitates major housing development in the Upper Lee Valley and at Chessington.

This package of problems that it could solve are unique to the proposed Crossrail 2 scheme.

A feature of the Crossrail 2 plan as it is currently developed is that there is an option to extend a route to East London (shown in Figure 3.7 as an arrow pointing eastwards from a junction at Angel). Given the pressures of development in East London, adoption of this eastern branch would potentially create additional access to developable land including for major housing schemes. It is currently being studied, alongside other alternatives, by TfL and the east London boroughs. With this addition, Crossrail 2 could address the further growth area in the Thames estuary corridor. The further tunnelled construction would add additional cost however, so consideration may be given to the balance of aspects within the current scheme to ensure similar benefit, such as the New Southgate branch which although providing access to train depot facilities is not expected to support the level of housing growth as a branch to the east would do. An eastern branch could be part of a phased construction approach.



Figure 3.6: Map of proposed Crossrail 2 route with potential route options
 Source: Crossrail 2 website

Close Alternatives to Crossrail 2

The principal alternatives to Crossrail 2 that have been examined by TfL serve, at least in part, the same geography and problem-set addressed by Crossrail 2. They are:

- national rail network-based scheme to add a fifth track to the Waterloo lines to add capacity from the south west into Waterloo; adding a West Coast Main Line (WCML) branch to Crossrail 1 to address potential Euston area overcrowding; and a low cost upgrade to the Lea Valley route; and
- cut-back 'Metro' version of Crossrail 2 that would operate between Wimbledon and New Southgate.

The scheme to add a fifth track to Waterloo is unappealing on its own because the additional demand it would support would need to be 'dispersed' from Waterloo on an unimproved London Underground network and this has not been included as part of this package. The business case developed for the national rail package noted above looks reasonable (and higher than that for Crossrail 2) but the contribution of each of its three elements cannot be distinguished, and costings may now be out of date and in need of upward revision. Studies have indicated that the Crossrail 2 'branch' on the West Coast Mainline has a 'good' BCR score, so this may be a reason for the overall BCR result of the national rail package.

Notwithstanding the issue of onward distribution at Waterloo, the Network Rail digital railway programme includes the adoption of higher levels of European Train Control Systems (ETCS) level 3, than are being used on Crossrail and Thameslink, and incorporation of driver assistance and service management technologies. In combination with infrastructure investment at junctions and stations, and with changed operating practices, these technologies may allow an increase in the throughput of existing lines, in terms of trains per hour. This could improve the benefits of the scheme. While ETCS applications to busy commuter railways at level 3 have not yet been implemented, and the business cases have not yet been developed, in the fullness of time they may, with associated infrastructure investment, permit increased service frequencies and capacities on the national rail network. However, even with the potential of such technology, without new lines such as Crossrail 2, major rebuild of capacity-critical locations such as Clapham Junction would be increasingly essential as passenger numbers continue to rise.

TfL's analysis suggests that the BCR of the cut-back Metro version of Crossrail 2 is lower than that for the scheme as currently developed. So neither direct comparator looks to be a better approach (although the Crossrail 1 connection to the West Coast Mainline and upgrades to the Lea Valley appear to have stand-alone merit).

3.5 Other alternatives to address the identified network gaps and opportunities

There are other schemes at various stages of development, and some of these could be examined in the East London Transport Study now underway. An extension of the DLR from its existing terminus at Bank to Kings Cross/St Pancras and Euston has been the subject of TfL feasibility studies and has a cost estimate of around £2.5bn. If Tower Gateway station is closed and higher capacity trains are deployed on the DLR (plans for both of which are under consideration), then this could create a valuable way of increasing capacity (with potentially a 40 trains per hour frequency) and connectivity between the West End, the City and the East London growth area, including the Isle of Dogs. This project could be considered to be an alternative to an eastern branch of Crossrail 2. In any event, since both projects serve Euston/Kings Cross there would clearly be merit in examining their inter-relationship and the scope for design integration and cost savings. Specifically the Bank – Euston scheme could:

- address a major dispersal and London Underground congestion problem (the city branch of the Northern Line) from Euston to the City;
- provide access to major development sites on the east side of London and provide enhanced connectivity from three important London terminals to the City and Canary Wharf/Isle of Dogs;
- provide a one-change alternative route between Waterloo and Docklands, relieving to some extent pressure on the Jubilee line;
- provide direct access from Canary Wharf to the High Speed 2 terminal at Euston;
- provide a suitable means of passenger transfer between Euston and St Pancras/Kings Cross (so linking High Speed 1 and High Speed 2); and
- by extending the Docklands Light Railway beyond its original territory, providing better connectivity, facilitating housing development in the Isle of Dogs and the wider 'Thames Gateway'.

There are no other fully-developed major schemes for national rail expansion in central London, but neither Crossrail 2 nor the DLR Euston extension (separately or in conjunction) addresses all of the gaps identified.

There is currency in the view that there is a case for a third Crossrail scheme and one version of this would be to extend the existing Lea Valley line southwards from its end-point at Stratford to the Isle of Dogs and then southwards across the Thames to connect with the national rail network, possibly connecting with the Brighton Main Line and providing congestion relief to it. Another proposition considered in the original Central London Rail Study of 1988 was a southwards extension from the Moorgate (northern city line) terminus. At the time this was conceived as a short tunnelled route to London Bridge, but this possibility and the case for it have been overtaken by events (including the adoption of the Thameslink scheme). A contemporary version that could address remaining gaps might be to extend the line from its current Moorgate terminus to a new station at Cannon Street and thence to Waterloo (at which point the line could potentially be extended to join a pair of the Waterloo line tracks in the Battersea area. This scheme could:

- be a cost effective cross-London route connected into national rail lines at either end, with only a limited need for new tunnelling (and only two new underground stations);
- relieve congestion at Waterloo and address the key 'dispersal' problem of connectivity from Waterloo to the City (relieving the Waterloo & City Line, on which the potential for capacity increase is limited) and, by interchange with Crossrail 1 at Moorgate, partially relieve the Jubilee Line too;
- provide a less costly alternative to the Crossrail 2 branch to New Southgate; and
- connect north London suburbs and Hertfordshire towns (Welwyn Garden City, Hatfield, Hertford) with Waterloo/South Bank and South West London/Surrey.

One other potential project that is likely to interface with Crossrail 2 and needs to be considered is the extension of the new Northern Line route from Battersea Power Station onwards to Clapham Junction.

3.6 Regional Transport Investment

At present London acts as a hub and interchange for many national rail network journeys that with greater orbital connectivity could be undertaken without the need to pass through Central London. This is true of both long distance routes such as Southampton to Cambridge, as well as shorter routes such as Kingston or Sevenoaks to Croydon. As well as increasing demand for radial routes into central London that adds to the requirement for capacity upgrades, it increases journey time and reduces the potential for modal shift. Enabling these journeys to be made through the provision of non-radial (that is, orbital) routes could unlock wider benefits.

An example of improved connectivity is the East West Rail (EWR) route (new railway from Oxford to Bletchley and increase in services on the onward section to Bedford³⁹). This scheme provides increased connectivity to the stations on the route, by more than doubling the number of destinations accessible from EWR stations away⁴⁰. Such national rail network developments could support an intensification of distributed development on targeted urban centres across the wider south east.

The zone 3 Orbital Railway as promoted by the Mayor of London (Figure 3.3) could help enable reduce the number of people travelling into Central London to complete their through journey, relieving both capacity constraints at national rail termini as well as facilitating shorter distance suburban journeys.

3.7 Possible Refinements to Crossrail 2

The definition of Crossrail 2 has evolved through consultation and may yet evolve further (the question of adding an eastern branch being a significant change, for example). TfL has examined many options to see if useful refinements can be made, including whether stations should be included; further extensions would be worthwhile; or route alignments should be changed.

If the aim were to improve the business case as reflected in the project BCR, a number of further refinements to project scope might be considered.

Options to reduce capital cost are limited, and most have been considered in earlier stages of the project's development. It might be possible to shorten the extent of tunnelling significantly and to join with the national rail network in south west London much closer to Victoria, for example in the Battersea area – but this is likely to lead to significant consequential changes to the best routes to feed from the south into the cross-London core, would mean not serving Chelsea and may not relieve Waterloo line capacity. Another (more modest) version of this type of cost saving would entail examining a surface (in place of tunnelled) route for Crossrail 2 in the existing rail corridor between Clapham Junction and Wimbledon. There is land available along the route with much of this being within Network Rail ownership, but this does not provide the same extent of benefit of the current scheme which helps to address the capacity constraints on the Northern Line, for which a separate branch would need to be added.

Stations in the Central Activity Zone are already at a minimum, with only a single station planned between Victoria and Euston. New underground stations outside the Central Activity Zone may provide cost savings if removed, for example at Chelsea and Angel, but benefits would be diminished if Angel was removed, possibly disproportionately.

³⁹ East West Rail Consortium, 2015

⁴⁰ East West Rail Economic Case Refresh, 2014

Another approach would be to break the project into distinct phases, as a means of reducing annual budget impact. Since it is a cross-London scheme this means a loss of operational benefits and interim terminus arrangements would be required. A temporary depot would also be required to stable trains. But if it were to be considered, it would most likely take one of two forms. The first would be to build either from the north or south to an interim terminus at Euston/St Pancras as a stand-alone extendable first stage. Or the central section (Victoria to Euston/Kings Cross) could be built as a free-standing scheme (for subsequent extension) to address CAZ area congestion, leaving open subsequent route extension choices. But this would not open up housing development areas and would need to be configured to provide potentially expensive access to a depot site which would not help BCR performance. As housing is a key driver of the scheme this should be carefully considered prior to proposing.

A further refinement would be to review the New Southgate branch, either to remove altogether or deliver as part of a later phase. This branch does provide valuable depot facilities which would need to be provided elsewhere if not delivered at the outset or at all, but the development potential for this branch is significantly lower than the housing growth that could be supported elsewhere on the route, for example on the proposed route to the north through Upper Lea Valley or indeed on a branch to the east.

There are also ways by which the operating costs could change – and these can have a significant bearing on BCRs. Crossrail 2 is designed so that its services can be overlaid on top of existing services from the south west suburbs into Waterloo. This may lead to an over-specification of service levels on the various routes used in south west London. A better approach might be to presume that residual Waterloo services are withdrawn, since this brings three advantages – a saving in operating cost (fewer national rail services); the scope to introduce automated train control systems over the Crossrail 2 route which could then be operationally segregated from the main line network, reducing the operating cost of Crossrail 2 itself; and, the chance to provide additional services to Waterloo on longer distance routes that offer a positive financial contribution. Equivalent thinking could be applied in the Lea Valley corridor.

A fully segregated Crossrail 2 operation would bring into play the idea of very high frequency operations (40 trains per hour), and this may bring the opportunity to look for capital cost savings (shorter trains offering the same overall capacity could mean smaller stations) and/or additional benefits to users. This would not be possible if it is not fully segregated from other mainline services.

Benefits could be increased by many variations, but most would bring significant additional costs too. While there are clearly strong benefits in intercepting the Morden branch of the Northern Line (now planned at Balham), the extension of the tunnelled section of the Crossrail 2 route and the extension of all journey times to/from south west London beyond Clapham Junction are offsetting disadvantages (as is leaving Earlsfield and its associated densification area potentially ‘stranded’). A potential future option could be to serve Balham on a branch from a direct Crossrail 2 route to Wimbledon, and then there is the prospect of extending this line – potentially as a subsequent stage from Balham towards Streatham and the Brighton Main Line corridor (subject to appropriate land take).

The ‘fan’ of routes in south west London could also offer the opportunity to provide better direct connections between key locations such as Epsom, Kingston and Twickenham, fulfilling an aim of providing some orbital rail capacity in a part of London where this facility is largely absent and where there is significant scope to reduce private car travel and therefore bring substantial additional benefits. A short link to connect Motspur Park and New Malden would, for example, create a valuable orbital route based primarily on intensifying the use of Crossrail 2 branches. This could be part of a set of ‘local’ transport investment if larger scale development is progressed in Chessington.

3.8 Reviewing the Crossrail 2 Case

The case presented for Crossrail 2 on the whole follows DfT guidance with results as might be expected from such analysis. However, the sensitivities are less prescribed in guidance and therefore assessment of the sensitivities tested within the analysis is presented here, with recommendations should further analysis be undertaken as the project progresses.

In addition, as the assessment of GVA has less set 'rules' and the process evolves with the development of each large scheme, the range of benefits predicted for Crossrail 2 is large. A more detailed review of these are therefore presented here.

Crossrail 2 Strategic Case: National GVA Impacts

The DfT's analytical assurance guidance Strength in Numbers (2014) sets out the framework within which it expects analysis to be specified, produced and used⁴¹. In particular, where analysis is used to inform decision-making (either by Ministers or Investment Boards) it should be accompanied by an Analytical Assurance Statement, jointly prepared by the responsible analyst and policy-maker.

In reviewing the assessment of national GVA impacts produced to inform the Crossrail 2 Strategic Case it is helpful to consider the dimensions required by an Analytical Assurance Statement to convey to decision-makers the strengths, risks and limitations of the way analysis has been conducted and the uncertainty in the analytical outputs⁴². They are:

- reasonableness: the scope for challenge to the analysis;
- robustness: the risk of an error in the analysis; and
- uncertainty: the uncertainty inherent in the analysis and the extent to which this has been reduced by the analysis itself.

As noted by the study authors "*the techniques required for GVA analysis are far from settled and continue to evolve*". They go further to state that "if GVA metrics are to become part of the appraisal process, there is a need for clearer codification of the methods to be followed and the implicit mechanisms and assumptions on which the methods are based"⁴³.

It is not within the scope of this review to provide assurance regarding the reasonableness or the robustness of the analysis undertaken to generate estimates of the GVA impacts of Crossrail 2. However, we acknowledge the active role of the TfL Crossrail 2 Appraisal Panel had in advising upon the specification and delivery of this piece of analytical work, and therefore have no grounds to believe that the approach is not reasonable, or that there has not been sufficient space and time for proportionate levels of quality assurance to be carried out.

Also noted by the study authors is the "*relatively wide range of potential outcomes*" from the analysis. This spectrum of outcomes is driven by the range of assumptions that could be adopted regarding:

- the additional employment capacity generated and filled by Crossrail 2;
- the impact of this additional employment on UK economic density; and
- the relationship between changes in economic density and productivity.

By way of illustration, the sixty year present value of GVA impacts ranges from £16bn (assuming low take-up of additional employment capacity in the central activity zone and correspondingly large reductions in employment density elsewhere in the UK) to £102bn⁴⁴. While having a large range of potential outcomes provides decision-makers with considerable scope within which to express their own judgement on the likely impact of Crossrail 2, it does little to provide evidence to support strategic arguments regarding the case for intervention, and may invite criticism that the analysis could be used to justify any policy outcomes.

⁴¹ Strength in Numbers, Department for Transport, 2014

⁴² TfL, Crossrail 2 Business Case, 2015

⁴³ Transport Policy, Appraisal and Decision-Making, RAC Foundation, 2015

⁴⁴ All monetary values expressed in 2011 prices

This is not unusual for strategic schemes which rely upon wider economic conditions and the consequent actions of economic agents across a range of sectors and geographies to secure the realisation of wider economic benefits. However, narrowing the range of residual uncertainty will help to reduce the likelihood of a decision based upon the analysis being successfully challenged.

At this point in the development of Crossrail 2 it is not possible to attach a likelihood or probability to the range of potential GVA outcomes reported. However, further work should be undertaken to identify a 'most-likely' central scenario which represents an evidence-based 'best-guess' of the GVA impacts of Crossrail. This may be based upon existing empirical evidence, further supplementary analysis to contextualise the scenarios examined, or through structured but, ultimately, subjective techniques such as Delphi-surveys.

When compared to free-standing improvements to transport networks, city transport plans are much more likely to involve considerations of synergy and balance. This means moving away from the detailed economic appraisal to a higher-level logic map or narrative. In this context the assessment of national GVA impacts of Crossrail 2 is an important piece of work which helps to bridge the gap between a vision statement on the one hand, and a detailed transport appraisal on the other.

Analysis of this kind should cover the middle ground of what difference the project can be expected to make. In other words, it should respond to the question of whether visions of a transformed future are simply hype, or whether there is a clear evidence base to support them. As such, the analysis needs to be considered within the context of a much wider evidence base which informs all five-cases of the HM Treasury Business Case model⁴⁵. Taken in isolation, such studies may be viewed by critics as advocacy rather than analysis. In conjunction with other analysis, such studies are an important part of the balanced body of evidence which should be used to inform good decision-making.

Crossrail 2 Economic Case: Sensitivities

The Crossrail 2 economic and value for money case⁴⁶ reports the output of a range of sensitivity tests applied to the preferred crossrail 2 Regional scheme. These include sensitivities to:

- land use change (dependent developments);
- timing (phased delivery);
- demand (and therefore benefits) growth;
- fares policy;
- risk and optimism bias adjustments; and
- do-minimum network assumptions.

Overall, the sensitivities tested appear sensible and cover a broad range of both positive and negative unknowns. At face value the impacts of the scenarios upon the BCR for Crossrail 2 appear in line with expectations, although in many cases no impact can be ascertained as BCRs are only reported to one decimal place.

Where possible, if the likelihood of different outcomes can be quantified, we recommend they are included within a risk-based approach rather than analysed as discrete scenarios. This would allow TfL to analyse the impact of many of these factors, acting together, on the returns to the investment, and hence determine the likelihood of different levels of return. A key advantage of using such an approach is that it guards against excessive weight being placed on extreme outcomes that would require the coincidence of a set of unlikely events to occur.

Three of the sensitivities have been reviewed in more detail in order to understand whether there are additional tests that could be undertaken prior to or during the progression of the business case to the full business case. Recommendations are identified in the summary.

⁴⁵ The Green Book, Appraisal and Evaluation in Central Government, HM Treasury, 2011

⁴⁶ TfL, Crossrail 2 Business Case, 2015

Land Use Change

In the central case, land use assumptions are consistent between the do-minimum and do-something scenarios, as required by webTAG. For a scheme of the magnitude of Crossrail 2, however, we would expect to observe significant land use changes in the vicinity of stations. While the extent of land-use change will be constrained by the availability of land and premises, there is considerable potential for additional residential, retail and commercial land use relative to the do-minimum scenario.

The only sensitivity test that includes changes to land use is the 'funding case central case' scenario which includes net additional housing of 130,000 dwellings that are assumed to be developed by 2051⁴⁷. However, since the sensitivity test also includes a number of other changes from the central case, it is not possible to identify the impact of land-use change in isolation. In the absence of specific evidence regarding the impact of the additional housing it is not possible to comment on the magnitude of land use change in absolute or relative terms.

In addition to more homes, we might also expect businesses to relocate in the vicinity of stations within the city centre in order to take advantage of a deeper labour pool (business services) and increased footfall (consumer services and retail). As with residential land use it is important to understand the extent to which any changes that are dependent upon the transport intervention can be considered 'additional' i.e. would not have occurred in the absence of Crossrail 2⁴⁸. Moreover, interdependencies between transport investment, land-use policy and wider urban and regional development could be exploited to overcome coordination failures in which private developers are unwilling to invest in an area due to uncertainty regarding the return on their investment. Transport infrastructure of the scale of Crossrail 2 delivers a

credible signal to developers that a particular place will develop. As noted by Venables (2015) "if this resolves the coordination failure then the return to the investment can, potentially, be many times greater than the user-benefits alone."⁴⁹ No such impacts are picked up within the sensitivity tests applied.

In light of the discussion above, a far broader range of land-use changes would be expected to be considered within the case for Crossrail 2. These should cover residential and non-residential developments, and explicit attention should be given to the role of transport as a catalyst for improving coordination in other sectors.

Demand Cap

In the central case demand is capped in the final forecast year of 2041, ten years after the scheme opening year. This is in-line with current webTAG guidance which typically recommends that demand growth should be capped after a twenty year period from the year in which the appraisal is undertaken, with sensitivities to a cap of ten and thirty years also presented. However, for some interventions, particularly large infrastructure schemes with extended design and delivery periods, alternative approaches may also be considered. Despite limited information to justify the specific approach used, it is clear that Crossrail 2 falls into this latter category. Sensitivity tests of higher and lower demand growth rates are considered, alongside a 'central growth uncapped' scenario in which demand (and therefore benefits) and fares/costs are unconstrained beyond 2041.

It should be noted that capping demand is simply one of many methods for extrapolating long-term benefits. Doing so helps scheme promoters to avoid placing undue weight on increasingly uncertain projections generated by transport models over long time horizons. However, capping demand at a pre-determined level or at some point in time introduces a discontinuity into projections of future benefits that is unlikely to reflect the market dynamics we would expect to observe in practice. It also implicitly assumes that trip rates (per person) will contract indefinitely beyond the demand cap.

⁴⁷ TfL, Crossrail 2 Business Case, 2015

⁴⁸ DCLG's guidance on assessing the impacts of spatial interventions defines additionality as "The extent to which activity takes place at all, on a larger scale, earlier or within a specific designated area or target group as a result of the intervention"

⁴⁹ Incorporating Wider Economic Impacts within Cost-Benefit Appraisal, International Transport Forum Draft Discussion Paper, Venables A.J., 2015

By assuming that demand growth ceases completely beyond a predetermined cap year current practice is likely to underestimate the benefits of rail-based interventions and may lead to the under-provision of rail services. In the absence of any empirical evidence regarding the likely trajectory of long-term demand and benefits, a range of alternative methods for considering long term demand and benefits growth can be considered. These options are described in detail within Bates et al (2013)⁵⁰, *'Specifying the demand cap for rail.'*

One such approach involves extrapolating demand (and therefore benefits) beyond the final forecast year in-line with population growth. This has a number of attractive features compared to the current approach. It is straightforward to implement, can easily be explained and rationalised and avoids demand growth falling to zero abruptly beyond the final forecast year. We recommend that such a sensitivity test is prioritised within further work on the case for Crossrail 2.

Risk and Optimism Bias

In the central case for Crossrail 2, adjustments for risk and optimism bias have been applied in-line with webTAG guidance as set out in the formula below:

Risk and optimism bias adjusted cost =
(Base Cost excluding QRA) + (1+Optimism bias)

As can be seen from the formula, at this stage in a project's development any measure of Quantitative Risk Analysis (QRA) and contingency should be excluded from the definition of costs, even where the outputs of such an exercise exists. Only once schemes are more narrowly defined and further developed (typically at a level equivalent to Network Rail's GRIP⁵¹ stages 4 to 5) should QRA outputs be included within a central case assessment⁵².

In the case of Crossrail 2, the rates of optimism bias applied are commensurate with webTAG guidance for the current stage of scheme development. They also incorporate insights drawn from experience delivering Crossrail (in particular recognition that similar rolling stock will be required) and benchmarking against Thameslink costs. Ideally, however, these reductions would be justified in-line with the process described in HM Treasury's supplementary Green Book guidance regarding optimism bias⁵³.

For most schemes we would not expect a QRA to be carried out until later in the scheme development process. However, since outputs from such an exercise are available for Crossrail 1, it seems sensible to exploit the additional information that is available. In particular, since it is possible to derive a statistically robust understanding of the likelihood of different outturn costs occurring, established statistical techniques can be used to analyse how the scheme's value for money changes with specific assumptions on costs.

A key advantage of using such an approach is that it guards against excessive weight being placed on extreme outcomes. For example, assuming that the QRA has captured the full range of risks (both upside and downside) to scheme costs, there is only a 20 percent chance of outturn costs exceeding the P80⁵⁴ estimate. We recommend, therefore, that where the likelihood of different values can be quantified in this way, they should be included within a risk-based approach rather than analysed as discrete scenarios.

It is clear that the out-turn cost of Crossrail 2 will impact on the value for money, which is why maintaining a vigorous and disciplined approach to cost control should be a key priority for TfL.

⁵⁰ Specifying the Demand Cap for Rail, Bates J., 2013

⁵¹ GRIP is Network Rail's Guidance to Railway Infrastructure Projects process and methodology for identifying, assessing and delivering national rail projects.

⁵² In doing so, the mean estimate (Pmean) from the QRA should be included in the costs before optimism bias is applied

⁵³ Supplementary Green Book Guidance: Optimism Bias, HM Treasury, 2013

⁵⁴ P80 estimate is used in accordance with webTAG and is the 80th percentile cost, representing the probability of the final cost being less than 80% of the estimate

3.9 Summary

Crossconnecting existing radial lines with over-stretched central London terminals and congested onward distributor networks represents a highly efficient model for London's rail network development.

While the currently assessed economic case for Crossrail 2 is not strong, this is in part because the housing growth it is expected to unlock is in effect precluded from entry into the appraisal metrics.

There are other schemes which also need to be considered alongside Crossrail 2, given the substantial growth in demand expected through to 2050. Whereas in the past it was reasonable to plan new underground lines as free-standing schemes, there is a need now to consider a programme of complementary measures, one of which would be Crossrail 2. The interplay between these investments and in particular their timing needs to be considered.

A number of ways in which the case for Crossrail 2 could be enhanced have been considered and the opportunity to add an eastern limb would appear to be a crucial potential development. It is important to note that the BCR could also be improved with a reduction in costs. For example this could be through removing stations that provide a smaller benefit but have high construction costs.

The most critical of the sensitivities considered is testing additional demand scenarios with demand growth increasing beyond the final forecast year. In addition, using a risk-based approach rather than discrete scenarios should be undertaken, where the risks can be quantified.



4 Housing

4.1 The role of transport in facilitating housing delivery

4.2 Unlocking the potential of transport-led housing delivery

4.3 Crossrail 2 and housing

4.4 Crossrail 2 route alternatives to maximise housing delivery

4.1 The role of transport in facilitating housing delivery

Transport influences housing delivery through two main (and inter-related) mechanisms – planning policy and land values – with the latter capturing a range of other effects.

In London, the density at which new housing can be delivered is directly linked to Public Transport Accessibility Levels (PTALs). PTAL is a measure of the accessibility of any particular point to the public transport network, taking into account walk access time and service availability⁵⁵. The higher the PTAL, the higher the number of homes or rooms that are allowed on any given plot. A scheme such as Crossrail, when combined with improvements to local buses, can lead to significant increases in PTAL which in turn leads to higher allowable densities. Table 4.1 summarises the (broad) relationship between PTAL and housing density (measured in dwellings per hectare) as set out in the London Plan.

These policies in turn influence land values. Higher density development will usually yield greater profit and therefore higher land values.

Land-values will also be increased by increased demand to live in an area that has improved public transport, especially large-scale infrastructure such as the national rail network. Such infrastructure can significantly improve journeys to work and promotes more sustainable forms of living by placing more people within easy access of public transport modes and important shops and services – thereby enhancing quality of life.

Land values are important in this context for two reasons in particular. Firstly there are a few parts of London (mainly in the east) where residential land values are not significantly higher than commercial values. Given the high levels of contamination and the associated risk and need for remediation, this can be a barrier for delivery of some housing sites. Public transport can therefore help to remove viability constraints through increasing land and property values, promote changes of use e.g. industrial to residential and support increases in the density of development thus increasing efficiencies in the use of land. Secondly, the uplift in value can have revenue implications for the public sector, which can in turn help raise funding for transport schemes. Public revenue sources such as the Community Infrastructure Levy, Stamp Duty, and Council Tax all have a link back to values.

PTAL	Suburban	Urban	Central
0	40	46	46
1	40	56	64
2	56	91	132
3	64	109	158
4	76	123	238
5	97	174	301
6	115	225	355

Table 4.1: Public Transport Accessibility Levels (PTALs) and development units
Source: Summary of data provided in London Plan, 2010

⁵⁵ PTAL includes walking time from origin to the public transport access point; reliability of the service modes available; the number of services available within the catchment; and the average waiting time.

4.2 Unlocking the potential of transport-led housing delivery

Where transport serves areas that have particular planning designations the case for Crossrail 2 assumes that these would need to be changed. Such designations currently include:

- strategic Industrial Land (SIL) – and local equivalents;
- green Belt and Metropolitan Open Land; and
- policies that restrict height or density.

For Crossrail 2 (a large-scale regional scheme), the main opportunities for major development will be on SIL and Green Belt designated land.

In most places residential land values will be so much higher than existing use values that simply changing policy is likely to be enough to promote change, but some form of land assembly would allow a more comprehensive approach to development e.g. through Compulsory Purchase Orders (CPOs), as well as capturing more value, and mechanisms such as Local Development Orders (LDOs) can speed up and create more confidence/certainty in the planning process. The ability to apply the ‘no-scheme works’ validation assumption in compulsory acquisition substantially enhances the ability to capture land value increases and should not be under-estimated.

There are other barriers to delivery, including:

- the need for complementary investment in other infrastructure (e.g. schools, local transport etc.);
- the ability of the housing and construction industries to deliver (and fund) an increase in output; and
- local and political opposition – in outer London higher density has traditionally been resisted and outside London there is significant opposition to large increases in housing delivery.

There is a range of evidence from studies of the effects

of transport infrastructure investment on development including:

- **Jubilee Line Extension** - there is evidence to suggest that residential development has increased at a faster rate in the JLE corridor than in the other parts of East London since it was approved⁵⁵. Once the line was implemented, development growth around stations along the line exceeded expectations. The scheme generated a total property value increase around Canary Wharf and Southwark stations of £2.1bn in the first three years after opening (1999-2002).
- **Langdon Park Station, DLR** - this station (formerly known as Carmen St) was planned on the original routing but never came to fruition. Years after the DLR became operational, a station in this location opened. The evaluation report concluded that the new station ‘generated a step change in local development activity’ but that ‘average property values in Langdon Park have not risen faster than in Stepney or the rest of Tower Hamlets’⁵⁶.
- **Crossrail 1** - A report into the property impacts of Crossrail 1 highlights that even before its completion the route is ‘already having an impact on investment decisions’. Changes are expected to be most significant at Stratford, Custom House and Brentwood. The impacts of the early stages of the project have not had a clear influence in locations along the route. However, impacts are expected to become more pronounced as the scheme progressed. The report did state, however, that in trying to identify the impacts of the pre-construction phase of the development is complicated by the fact that it relies on historic data it is more difficult to disaggregate the direct Crossrail effect from other influences on local property markets⁵⁷.

⁵⁵ The Jubilee Line Extension Impact Study – Main Findings and Lessons Learned, Association for European Transport, 2004

⁵⁶ No Train, No Gain: The Local Economic Impact of Langdon Park DLR Station, Dave Arquati, Principal Transport Planner Transport for London, 2013

⁵⁷ Crossrail Property Impact Study, GVA, 2012

- **Northern Line Extension** - required to unlock the potential regeneration at Vauxhall, Nine Elms and Battersea Opportunity Area – ‘many of the new homes and jobs in the VNEB OA are directly dependent on construction of the NLE’⁵⁸.
- **London Overground** - unlike many major infrastructure projects such as Crossrail, the Overground came into being quickly with only a year between TfL announcing that it was to take over the service and going live. Much of the line already existed so change was in the form of improved trains, stations and frequency of services as well as the new links. The addition of the Overground to the tube map is considered to have been a particular ‘boon’ for the areas it serves. ‘Previously overlooked locations have been brought to the forefront of property hunters minds... both prices and activity have not only outperformed the local areas in which the stations sit but also the wider London housing market’⁵⁹.

Transport related development in ‘Journey to Work’ Counties

Delivery of housing in these areas is (mainly) not constrained by regional transport capacity. The main constraint is Green Belt, local infrastructure, and local opposition to house-building.

The ability of London to accommodate the levels of population and economic growth anticipated is likely to require an approach that looks beyond London’s boundaries. Therefore, a collaborative approach to growth is likely to be required – if not in the short term then in the longer term. There are strong strategic inter-dependencies between London and the wider South East that underpin their success. This relationship is already being recognised through dialogue that has started to take place between London, East and South East England at events such as the Wider South East Summit (March 2015). The Mayor’s Growth Commission is also examining these opportunities.

Within London the GLA can use its planning powers (including plan-making) to ensure changes in policy and delivery. Outside London, the GLA can use the Duty to Cooperate, but requires reform to be effective.

There appears to be a need for some form of multi-local authority plan that aligns housing delivery with infrastructure investment. This could substantially reduce the risk that housing delivery will not follow infrastructure investment. This has been a feature of some of the devolution deals that Government has agreed with combined local authority areas across the country.

Those counties which could be impacted by Crossrail 2 e.g. Hertfordshire and Surrey, support plans for the regional option for the route. Historically these counties, however, have failed to deliver against their own housing targets and it is known that no local plan on the edge of London has so far even consulted on the option of meeting some of London’s need. The Mayor of London has submitted representations to the government’s Local Plans Expert Group to the effect that the mechanisms currently available through the Duty to Cooperate⁶⁰ are inadequate to achieve the necessary change.

⁵⁸ Public Inquiry Decision Letter from the Secretary of State for Transport, November 2014.

⁵⁹ Market Insight – Going Overground, Hamptons International, 2014

⁶⁰ Duty to Cooperate - places a legal duty on local planning authorities, county councils in England and public bodies to engage constructively, actively and on an ongoing basis to maximise the effectiveness of Local and Marine Plan preparation in the context of strategic cross boundary matters, Localism Act, 2011

4.3 Crossrail 2 and Housing

Crossrail 2 has a number of apparent objectives. For example, Crossrail 2 will help reduce congestion and create capacity on the central London rail and underground network, as well as relieving pressure on main line national rail termini but it also has a distinct role in delivering housing growth for London, both generally but also specifically. The strategic case for Crossrail 2 identifies the potential for it to unlock 200,000 homes. The case also relies on that outcome being achieved.

The ability to facilitate large-scale housing development is important in a number of respects:

- housing in close proximity to stations will generate fare revenue;
- providing much needed housing for London forms an important part of the wider benefits of the scheme, whilst the uplift in land value generated by residential development will feed directly into the calculated business case; and
- land value capture can help fund Crossrail 2.

Releasing the potential for so much housing development, however, requires at least 3 elements of planning policy change, each of which may be considered controversial, i.e:

- the development of greenfield, including Green Belt sites;
- the increased density of development; and
- the re-designation of current Strategic Industrial Land.

Questions inevitably arise about whether the scale of land use change is feasible, desirable and deliverable.

Feasibility and Desirability

The capacity for this scale of land-use change has been explored in the Crossrail 2 studies⁶¹. AECOM and GVA consider that the release of an additional 130,000 homes would not represent a significant departure from existing policy and we agree. We consider each of the principal components is realistic.

Building to a higher residential density in suburban London is not inconsistent with policy, so long as public transport accessibility improves. In fact, the Mayor of London's density matrix is regularly exceeded and the Mayor of London tends not to object to development on density grounds per se but to be more concerned about design and sustainability. In newly developed Opportunity Areas, in particular, master planning led by the Mayor of London's team positively encourages higher densities. At Vauxhall Nine Elms Battersea, for instance, virtually every development exceeded the density matrix – and was consented before Transport and Works Act approval was achieved for the Northern Line Extension on which the higher densities depended.

The London Plan recognises that there will be a phased release of Strategic Industrial Land and paragraph 4.23 of the London Plan specifically provides that “the release of surplus industrial land should as far as possible be focussed around public transport nodes to enable higher density redevelopment, especially for housing”. AECOM/GVA report agreement with the GLA that the scale of industrial land release on which their Central Case is based is comparable to that anticipated;

- the central case assumes relatively small scale development in the Green Belt with only around 10 percent from Green Belt or greenfield development (AECOM/GVA paragraph 6.2.19).

⁶¹ TfL, Crossrail 2 Business Case, 2015

Achieving 200,000 homes would require more significant policy changes and, particularly, increased release of both SIL and Green Belt. Whilst that may appear ambitious from today’s perspective, it is important to note the strategic context for future planning policy in London.

To get to its Central Case, AECOM has proposed a revised Density Matrix for the London Plan which is typically around 50 percent higher than the existing one. Table 4.1 sets out the existing densities presented within the GLA’s Strategic Housing Land Availability Assessment, whilst Figure 4.1 presents the potential for additional growth delivered by Crossrail 2.

The key difference between the Central Case and the 200,000 homes appears to be the amount of land that is released rather than the change in density.

For example, Vauxhall Nine Elms Battersea (VNEB) Opportunity Area is on average being delivered at 350 dwellings per hectare (on a site by site basis, ie excluding roads, parks, office space etc). The Isle of Dogs is closer to 400+ dwellings per hectare, with some sites significantly higher (e.g. South Quay Plaza at 700 dwellings per hectare).

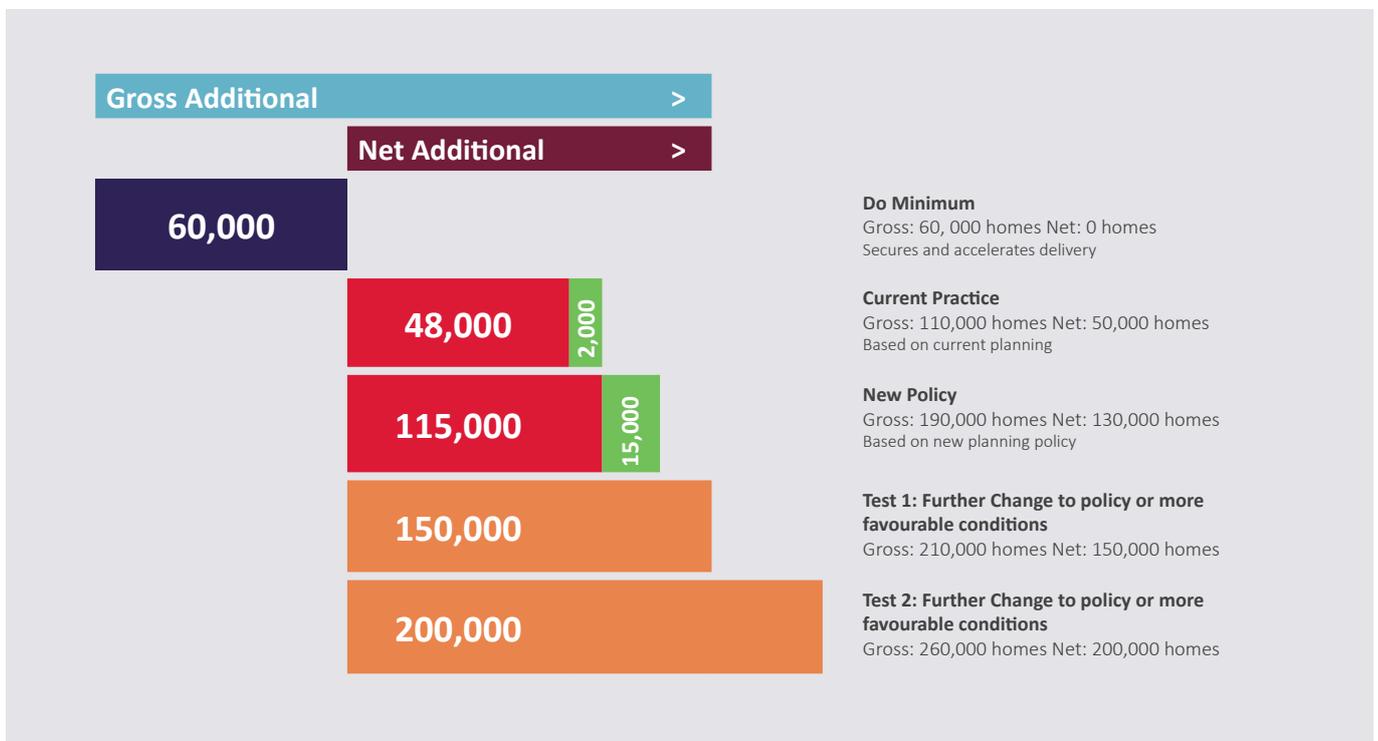


Figure 4.1: The potential for Crossrail 2 to deliver 200,000 homes
 Source: TfL, Crossrail 2 Business Case, 2015

The key issue is often setting and design. For example, the topography of the land between the Lea Valley line and the River Lea is such that very tall buildings could be appropriate and an overall density of 300+ dwellings per hectare could be designed in such a way as to be appropriate for the setting. This would be central London levels of density which would be new to outer London and potentially controversial but the purpose of planning at that density would be clear and the effect would be to save further land release. Properly planned and designed, we consider this to be achievable.

The Strategic Housing Market Assessment for London 2013⁶² identifies an Objectively Assessed Need (OAN) of between 49,000 and 62,000 homes per annum. Paragraph 14 of the National Planning Policy Framework expects planning authorities to plan positively to meet their OAN. For example, paragraph 84 of the National Planning Policy Framework sanctions Green Belt changes where this is made necessary by the plan's requirements for sustainable development and national policy also requires existing constraints and designations to be reviewed in order to address development requirements.

Therefore, with or without Crossrail 2, London has to address these issues and there is already clear evidence of change, including:

- the London Borough of Redbridge is reviewing its Local Plan and planning significant Green Belt release;
- the London Borough of Enfield is consulting on its draft Local Plan and explicitly recognises that the requirements for housing growth will require either the de-designation of SIL or the release of Green Belt land (or both); and
- many London boroughs and suburban authorities (for instance in Surrey and Hertfordshire) are preparing new Local Plans to accord with the National Planning Policy Framework and a number have commissioned Green Belt reviews.

It follows in principle that the changes to policy constraints required for Crossrail 2 to facilitate 200,000 homes are already in train. The release of Green Belt and industrial land is already happening, but Crossrail 2 will enable this release to happen in a more structured and sustainable way.

The scale of housing release predicated, therefore, is both feasible and necessary.

It should also be noted, that Strategic Industrial Land (SIL) is often not strategic. It is a consequence of a designation made more than twenty years ago and often simply reflects where industry was located. Many of these locations are not well connected to the strategic road network so cannot function the way the designation suggests. This would apply to, for example, Brimsdown which is halfway between the M25 and the A406 but connected by a relatively congested road (although it is home to some large-scale bad neighbour uses).

Significant areas of SIL also contain uses that do not fall within the definition, for example, churches and wholesalers. There is therefore a question about whether that needs re-providing in the location, or if it can be provided as part of mixed-use scheme as it is not a bad neighbour use. There is some scope for double-decking warehouses but even in congested west London in Park Royal and around Heathrow it has not yet become very common (although there may be other reasons for that).

The scarcity of land and rising land values is and will in any event increasingly lead to greater efficiency, with lower value uses relocating to lower value locations. There is bound to be more that can be achieved in this way and a number of London activities can inevitably be undertaken from outer London locations, such as M25 towns, London Gateway or further afield. This is part of a continuous process of adaption which has been going on for decades but which has been slowed in the Upper Lea Valley due to low values. It should not automatically be assumed that land and industrial uses need to be replaced, at least not in London and neither is the case proven for compensating Green Belt release.

⁶² Strategic Housing Market Assessment for London 2013, GLA, 2013

Deliverability

Deliverability in this sense means both deliverable by the market and deliverable through a necessary consenting regime.

Above, we have identified those studies which confirm the well-known understanding that transport infrastructure can transform property values and facilitate viable development. In this context, the prospect of Crossrail 2 is already having impacts on the property market. For example, the London Borough of Enfield is seeking a development partner for Meridian Water, a large area of low quality industrial and mixed use which has not historically attracted significant residential development interest. With the prospect of a Crossrail 2 station at Angel Road, however, three leading developers are short listed and competing strongly for the opportunity to build a minimum of 8,000 homes but with the prospect that Crossrail 2 would release the potential for significantly more homes.

In the short term, therefore, deliverability is more concerned with two more pressing practical problems:

- the ability to achieve the necessary consents; and
- the potential to manage the delivery of the development unlocked by Crossrail 2 in order to ensure that it comes forward appropriately and in order to maximise the potential to capture value from that development.

There are alternative potential consenting regimes for Crossrail 2 including a Hybrid Bill, a Development Consent Order under the Planning Act 2008 and potentially either of these combined with Town and Country Planning Act powers taken, for instance, by a Mayoral Development Corporation. A genuine difficulty arises, however, from the need to co-ordinate the selected consenting regime with the availability of the necessary policy support.

The Government could generate policy support for Crossrail 2 by endorsing a recommendation of the National Infrastructure Commission, making a Ministerial Statement or producing a National Policy Statement. Each of these is easier for the rail route, however, than it is for the significant land use change on which Crossrail 2 is dependent.

There would be little purpose, for instance, (or business case) in routing Crossrail 2 along the Upper Lee Valley unless it was clear that a significant land use change would be achieved – particularly the de-designation of strategic industrial land and the release of Green Belt land in the vicinity of stations. The necessary certainty that land use change would be achieved, however, requires planning policy to be in place. There are options for planning policy formulation including:

- the review of the London Plan – although that would only cover part of the route;
- encouragement from Government that the constituent authorities along the route (particularly to the north and to the south) should produce joint strategic local plans for the route (using powers of direction being obtained through the Housing and Planning Bill); and
- Government policy, such as a National Policy Statement (assisted by a legislative change that would allow a National Policy Statement and a subsequent Development Consent Order application to deal with more than “an element of” housing).

Each of these options, however, requires the preparation of policy, public consultation, environmental assessment and the examination and endorsement of policy. It is difficult to imagine such a process taking less than approximately three years, which suggests that any final endorsement of Crossrail 2 should be deferred until that policy is in place – otherwise the decision would inappropriately pre-judge the outcome of an important planning policy process. Progressing Crossrail 2 in parallel may be possible but it would need to be very carefully done to avoid the challenges that controversial land use policy change was being pre-judged.

The scale and significance of Crossrail 2 is such that the Government should consider a bespoke consenting and delivery regime. There is a clear case for the promoters of Crossrail to also promote the land use change which it would facilitate and on which it depends. Such an approach would offer the benefits of certainty that the land use change would be achieved and enable it to be co-ordinated to achieve an optimum outcome, rather than being left to existing land owners to take up (or not) in a piecemeal fashion.

Such direct delivery would also maximise the potential for value capture. The Compensation Code allows the value up lift of the scheme to be discounted from the acquisition price of land where a CPO is necessary – enabling the promoter to benefit from that up lift. Additionally, such a promoter could hold land for the longer term in order to realise the enhanced land value achieved by the regeneration benefits of comprehensive, sustainable development.

The National Infrastructure Commission should recognise these complexities and the need for a special policy, consenting and delivery regime.

Specifically, a policy framework needs to be created to support and sanction the land use change on which the case for Crossrail 2 depends (and which Crossrail 2 would facilitate) – either as part of the same policy framework that would be used to endorse Crossrail 2 itself, or a complementary but contemporaneous framework. Government has options in this respect, but some would be more effective than others and the choice depends on how directive and interventionist government is prepared to be:

The London Plan

Use of a revised London Plan is not ideal as its finalisation will be complicated and slowed by the wide range of other issues that it needs to address and, importantly, because it does not cover a significant length of the route that is outside London and which is where some of the significant changes need to happen. The next London Plan will need to reflect and support rather than carry the principal policy decision.

A National Policy Statement under the Planning Act 2008

A scheme-specific National Policy Statement would be effective in many ways but handicapped in this case because the emerging freedom in the Housing and Planning Bill to include housing in development consent order applications is limited to “an element of housing” and would not be sufficient to support the scale of housing necessary – unless the Bill is amended. However, it is probably now too late to make such a substantive change.

A Joint Local Plan prepared by the Mayor of London and each of the constituent authorities along the route

This would probably require two Joint Local Plan (JLPs) – one for the Upper Lea Valley and beyond to the north and one to the south, but it could be an effective and democratic way of coordinating land use change. Many authorities already voluntarily prepare JLPs with their neighbours but there is no ability at present for them to be compelled to do so. However, the Government is taking powers in the Housing and Planning Bill to allow the Secretary of State (SoS) to intervene more directly in plan making and those powers could allow the SoS to require the authorities to prepare a JLP and to indicate the timescales and governance arrangements that should apply. This, therefore, is new territory but it is in fact well suited to the purpose of the necessary local policy formulation. This approach would need to be supported by a statement of government policy – this could simply be a Ministerial Statement based on a recommendation from the NIC and it could effectively advise the outcome that is expected from the joint plan. Any Statement (to inform this or another route) would need to be carefully worded to avoid the challenges that followed the HS2 announcement – the more directive it is the more it may need to be underpinned by a Strategic Environmental Assessment. This is a good option for establishing a local policy framework to plan for change. A JLP would establish clear and relatively detailed development plan support, bringing more confidence that the necessary land use change would be achievable and that its consequences could be planned and supported in a coordinated way.

It would also allow local engagement and control over local outcomes. However, a JLP would not deliver change as it would rely on land owners to bring forward proposals.

Crossrail 2 would still need its own consenting route but it could be progressed in parallel with JLPs, backed by the support in a government statement and supported in parallel by an emerging new London Plan.

Government could create the policy framework itself

Ministerial Statements or White Papers are Government policy and there is no reason in principle why a fairly detailed one could not be prepared in this case, following consultation and following the preparation of Strategic Environmental Assessment. A model could be the Air Transport White Paper (ATWP) 2003⁶³, which contained detailed policies for many of the country's airports, including layout plans, etc. The ATWP took several years to prepare but a Crossrail 2 specific White Paper could be significantly faster, particularly given the preparatory work already undertaken by TfL. The White Paper would then give authority for Crossrail 2 to be progressed and would establish the confidence that local plans would need to respond positively to support land use change.

This option has attractions because it would create a firm foundation for both the Crossrail 2 and the land use change consenting routes. However, this is a relatively slow option as it defers the important steps of consenting – and it would still require local plans to be prepared with greater local definition.

Special Development Order

A more direct consenting route is theoretically possible, particularly through a Special Development Order (SDO) made by Government. We believe SDO powers still exist but have not been used for more than 20 years. In principle, a SDO could simply grant permission for anything, although it would need to be consulted on, supported by Strategic Environment Assessment (SEA), Environmental Impact Assessment (EIA) etc.

SDOs do not provide CPO powers. In practice, however, SDOs have hardly ever been used and are not well suited to something as large scale and complex as Crossrail 2 and, particularly, the extent of the land use change contemplated here - the power is better suited to a single site consent and an SDO would also appear to be undemocratic, cutting across the checks and balances of other consenting regimes.

Use of the New Towns Act

The New Towns Acts (1946 and subsequently 2015) gave Government power to designate areas of land for new town development under the direction of a Development Corporation. The Acts allow the establishment of a Corporation with the following key powers:

- the power to compulsory purchase land if it could not be bought by voluntary agreement;
- the power to buy land at values which reflect a 'no scheme world' and, therefore, to capture the betterment for the benefit of the wider community;
- the power to borrow money (with some limitations);
- the power to prepare a masterplan which, after public inquiry and approval by the Minister, would be the statutory development plan;
- the power to grant or refuse planning permission;
- the power to procure housing subsidised by government grant and by other means and to act as a housing association in the management of housing; and
- the power to do anything necessary for the development of the town, such as undertake the delivery of utilities or enter into partnership working with other agencies.

⁶³ Air Transport White Paper, Department for Transport, 2003

In principle, this type of approach to comprehensively securing an objective is an attractive option – combining plan making, assembly and consenting powers, although Crossrail 2 would still need to be consented separately but in parallel, with both processes legitimised by a clear initial statement of government policy. The apparent imposition of a Development Corporation on the local area could be softened by engaging representatives of the local authorities within it.

Whichever policy and consenting route is taken the common first step involves a high level, early government policy statement or announcement which does enough to give authority and impetus to the next steps but which does not go so far as to prejudice the outcome (because to do so would be open to challenge given the lack of sufficient SEA and consultation undertaken at that stage). After that there are choices but it is important that a policy framework to support land use change is worked up in parallel with the consenting route for Crossrail 2 (which is probably a Hybrid Bill but which could be a DCO). Neither can prejudice the other but both need to gain sufficient confidence and impetus from the originating Government policy statement that the legitimacy of their intended outcomes is established from the start.

In addition to the policy framework, there are other barriers to delivery, which suggest that a direct approach to implementation would be desirable. In London these barriers include the slow rate at which permissions are converted to delivery and the concentration of land in the hands of reluctant developers.

The upfront costs of infrastructure can also be a barrier to delivery of large sites, which has been the case at Barking Riverside in London and Ebbsfleet Valley in Kent Thameside. Both of these have required significant public sector contributions to provide key early infrastructure and enable housebuilding to follow. Plan making by local authorities can also be slow and difficult to co-ordinate if plans are the separate responsibility of individual authorities spanning administrative boundaries.

The importance of coordinating all of these policy, consenting and delivery factors suggests that a clear, determined approach needs to be taken to establish an authority with the power to direct the necessary outcomes. A Development Corporation based on the type of powers available to New Towns Corporations would be an appropriate delivery vehicle but even then government would need to assist significantly with a proportionate early policy statement and by putting in place the governance arrangements for coordinated working between those promoting crossrail 2 through its consenting process and the Corporation, whose role would be to plan and deliver land use change.

4.4 Crossrail 2 Route Alternatives to Maximise Housing Delivery

A high-level assessment of development potential along a number of possible route alignments for Crossrail 2 in east London has been undertaken and although this work has not yet been finalised, it has identified some areas where there is significant development potential.

An Eastern Branch starting from Hackney Central would be able to serve either Stratford or West Ham and possibly Barking Town Centre, before potentially joining the C2C corridor to Tilbury or crossing the Thames into Thamesmead.

Given the high existing levels of accessibility at Stratford (including Crossrail 1), and the relatively advanced stage of implementation of the masterplans for the area, Crossrail 2 is unlikely to have a significant impact on development potential.

There is more scope around West Ham where there are several protected industrial sites that could deliver up to 10,000 homes above the current London Plan projections. However, given that the station is already served by three London Underground lines, the Docklands Light Railway and national rail services, it is possible that this level of development could be served without the addition of Crossrail 2.

Barking Town Centre is almost as well-served and does not have a large number of sites suitable for re-development that are not already identified in planning policy.

The largest area of potential is the London Riverside Opportunity Area. This contains over 1,300ha of industrial and vacant land. At a relatively modest density of 100 dwellings per hectare this could support up to 100,000 homes.

Within this area there are several sites that are already coming forward and a number that are designated for growth industries (including a Sustainable Industries Park) so not all of this could be delivered by Crossrail 2, but it remains a very substantial opportunity.

Beyond London in South Essex, opportunities are more limited. The area around the M25 is likely to remain a preferred location for employment and distribution and the existing urban areas have relatively limited re-development potential. There could be opportunities for Green Belt release and in the longer term for re-development of parts of Tilbury Docks.

There are also substantial development opportunities south of the river in Greenwich and Bexley.

Thamesmead New Town is to the north of the Abbey Wood station on Crossrail 1. It is currently relatively isolated (served only by buses) and has a large number of potential development sites. We understand that one of the landowners has identified capacity for 10,000 homes, but the total could be closer to 30,000 homes. Extending the DLR from Gallions Reach and sharing the new road crossing would be an alternative way of improving the accessibility of Thamesmead.

Further east there are major opportunities around Belvedere, Erith and Slade Green stations. Together these could deliver up to 20,000 additional homes. However, it is likely to be easier to serve the area by extending Crossrail 1. The same would be true of stations in Dartford and Gravesham in North Kent.

It is clear that there are far greater development opportunities from an Eastern Branch than would be possible on the route to New Southgate. The AECOM/GVA work⁶⁴ suggests just under 10,000 homes could be built on the New Southgate branch. The eastern branch is likely to have additional cost due to a greater length of tunnelling, but the benefits of the additional development may outweigh this and provide an uplifted BCR.

⁶⁴ TfL, Crossrail 2 Business Case, 2015

Case Study - Stockholm

The Stockholm Metro is a cross-city network 108 km long serving 100 stations. There are seven lines which all go through Stockholm City Centre in a very centralised metro system and it carries around 900,000 per day in a city region of around 2.1 million.

Stockholm is embarking on a SEK 26 billion plan (approximately £2bn) to expansion of its metro network. This investment will create approximately 19km of additional track, nine new stations, and is expected to be completed by 2025. With the city’s population growing to 2.6 million, the new lines are forecast to serve an additional 500,000 residents by 2030. 78,000 new houses will be built in four municipalities alongside the investment in the network.

There is also ongoing investment in a new, cross-city rail line which crosses central Stockholm through underground tunnels. The new “City Line” is planned for completion in 2017. At a cost of around SEK 16 billion (approximately £1.4bn), it will provide two new tracks and new underground stations. The tunnel will significantly improve the traffic throughput to and from south of Stockholm. It proposes 24 trains per hour in each direction, commuter services up to 16 trains per hour and eight regional and long-distance trains. The tunnel will take all commuter trains, from the old line

allowing more regional and intercity trains to operate.

The Stockholm Region accounts for 45 percent of Sweden’s GDP and almost one third of the Swedish job market. Supporting economic growth in the region is a major driver of the planned metro expansion; it is forecast to enable a 500,000 person increase in population in the area. It has been identified that Stockholm has reached a point at which its transport network is reaching capacity and therefore it has recognised the need to invest.

The Swedish Transportation Authority has established a government mandate that allows local and regional authorities to apply for the state to co-sponsor investments in transport that can enable new property construction, and the Stockholm metro expansion is an example of this in practice. Funding will be provided through a combination of government bodies, some of which will be passed on to Stockholm citizens as an expansion of Stockholm’s congestion charge scheme.



Figure 1: Stockholm Metro including new “City Line”

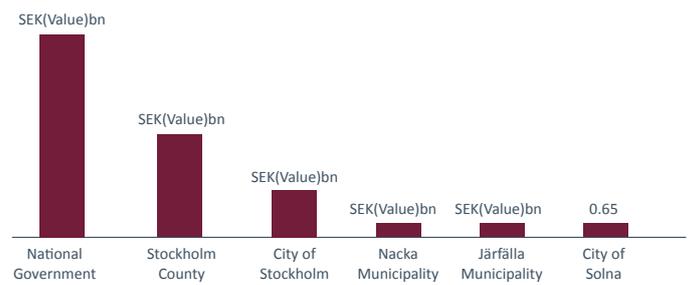
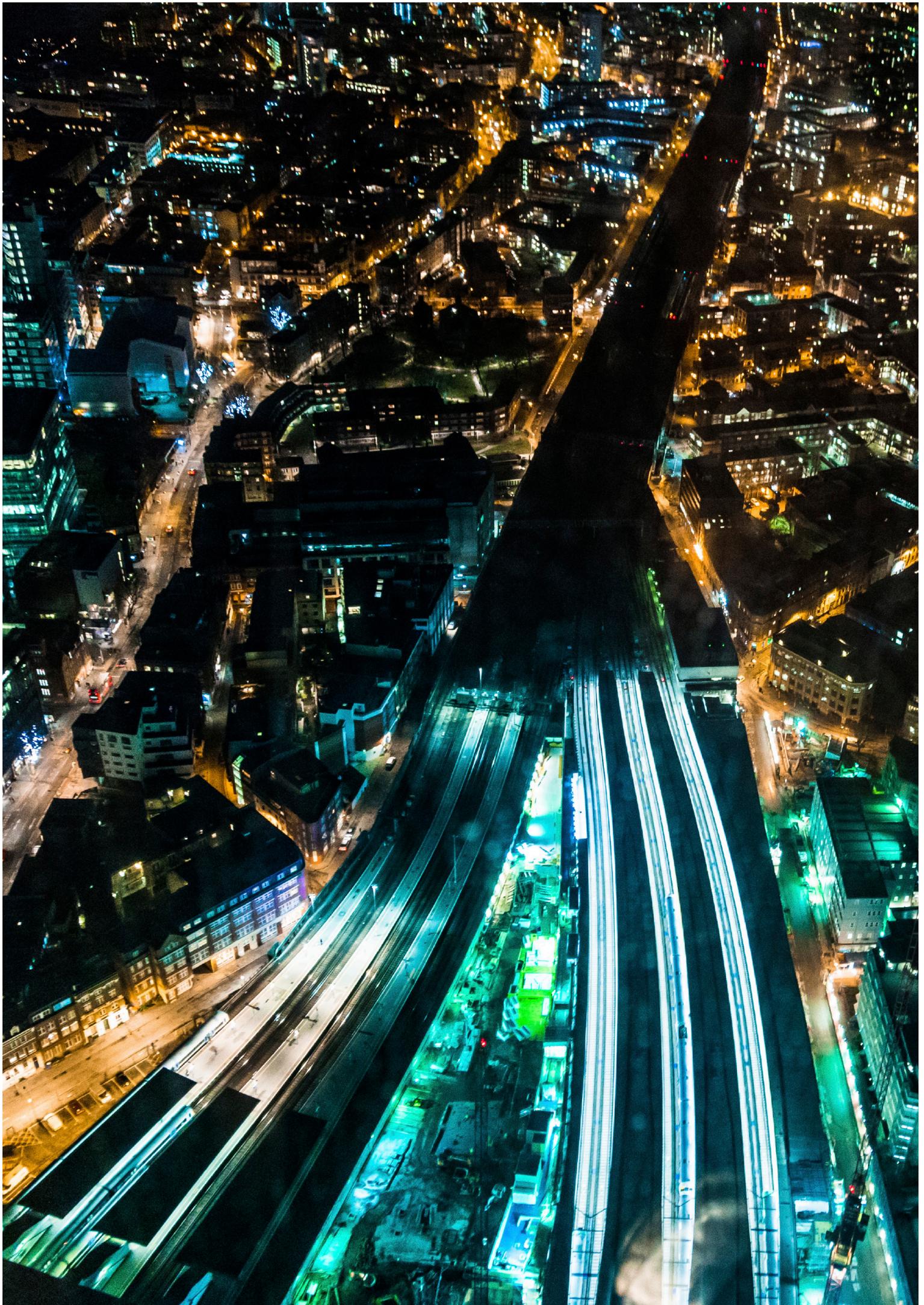


Figure 2: Sources of funding for Stockholm Metro expansion



5

Funding

5.1 Introduction

5.2 Funding

5.3 Options for funding

5.4 Financing

5.5 London and the regions

5.6 Funding and finance conclusions

5.1 Introduction

A variety of funding mechanisms are currently in place for Crossrail 1 and many of these have been highlighted as being potentially suitable to continue for Crossrail 2. In addition to these funding streams, this section explores further funding opportunities including user charging, land value capture and taxation to fund future infrastructure programmes and projects, and how these could work to support large scale transport infrastructure in London. A review of the approaches used within other cities has also been explored to understand how the recent “City Deals”⁶⁵ approach may be applicable to London.

5.2 Funding

For Crossrail 2, a 'funding challenge' was set for at least 50 percent of the total funding requirement of the project to come from non central Government sources and therefore be raised from other means. It is these other types of funding that will form the basis of this section.

The Crossrail 2 Funding and Financing Study⁶⁶ notes the importance of considering the profiling of funding when developing the case for the project. This builds on the National Audit Office report in to Crossrail 1, which notes that the up-front funding provided from Central Government was a core requirement in securing the other funding sources used in the project⁶⁷.

For this reason and because of the positive externalities attached to infrastructure projects, it is expected that central funding will continue to form part of the overall funding packages in the future. This is consistent with historical funding mechanisms in London and across the UK, as agreed through City Deals, Local Growth Funds and devolution arrangements. The key consideration for future infrastructure projects is the amount of funding and financing that should be raised from other or local sources.

⁶⁵ City deals have recently been the primary mechanisms for the specific infrastructure funding outside of London

⁶⁶ TfL, Crossrail 2 Business Case, 2015

⁶⁷ Crossrail, National Audit Office, 2014

Other funding streams

In the context of the challenge for at least 50 percent of Crossrail 2 to be funded by non central Government sources, it is important to consider the other potential funding mechanisms that could be used to fund large infrastructure projects such as Crossrail 2. In order to consider their appropriateness, the following criteria have been considered:

- their ease of implementation and time taken to implement;
- need for introduction or change to statute;
- volatility of income stream; and
- comparability to other projects where this type of revenue has been sought (if applicable).

Before assessing the funding options in more detail, it is useful to recognise the potential quantum each funding method could provide for Crossrail 2. It is worth noting that at this stage, this package of funding has not been agreed and several elements of the proposed streams will require further policy and legal changes to implement. In particular (as detailed in Table 5.1):

- earmarking Business Rate Supplement for Crossrail 2 after its use on Crossrail 1 (due to end in 2031);
- introducing a new Business Rate Supplement (BRS), which would require the balloting of businesses in London;
- seeking agreement with the GLA and local authorities in London to extend the Olympic levy; and
- securing agreement with Government to borrow against Mayoral CIL.

Funding Source	Funding & financing study (Nov 14)	Notes	Central Financial Case (June 15)	Notes
Net operating surplus	20.0%	Excludes national rail abstraction. Fares at RPI 1% to '21 then RPI +0.5%	11.6%	Excludes national rail abstraction. Fares at RPI 1% to '21 then RPI +0.5%
Mayoral CIL	11.6%	Assumes MCIL 'Enhanced and doubled' based on extrapolation of trend	16.9%	Assumes MCIL 'Enhanced and doubled' rate of development increases in line with FALP
Business rate supplement	15.2%	borrowing from 2033 to 2065	20.3%	Higher rate of RPI applied, -10% risk adjustment no longer applied
Council tax precept from 2017/18	1.5%	£8 per band D property	1.4%	
Over-station development	1.9%		6.3%	Reflects increase in land requirement, but the assumed recovery rate has not changed
Total % funded	50.2%		56.5%	
Total % after national rail extraction	42.6%		43.6%	

Table 5.1: Potential funding streams for Crossrail 2
Source: TfL, Crossrail 2 Business Case, 2015

Case Study - Hong Kong

The Hong Kong Mass Transit Rail Corporation (MTR) bought the land where new stations were planned for land revenue capture. MTR owns or manages approximately 50 major properties across the city and owns 13 shopping centres built on top of its stations. The USD\$2 billion profit surplus generated is used for capital expansion and network upgrades. MTR describes its traditional funding model for expansion as a ‘Rail plus Property’ model, in which funding consists of recurrent income from rail supplemented by the returns from property assets.

All tenants in the shopping centres pay rent (which went up by an average of 14 percent in 2014) to MTR, or have a profit-sharing agreement in place. The revenue split for MTR in 2014 excluding revenue from rail related subsidiaries outside of Hong Kong is 67 percent traditional funding and 33 percent non-traditional funding.

Non-traditional funding sources comprise revenue from commercial businesses, such as advertising sales and rental from duty-free shops and kiosks, and property rental and management income.

The MTR case study shows that land value capture from residents and landowners can be a sustainable way to fund large transport investments, when the government / transport authority owns the land. Transport for London owns an estimated 200 million square feet of land and has already announced plans to redevelop some properties into residential and commercial space.

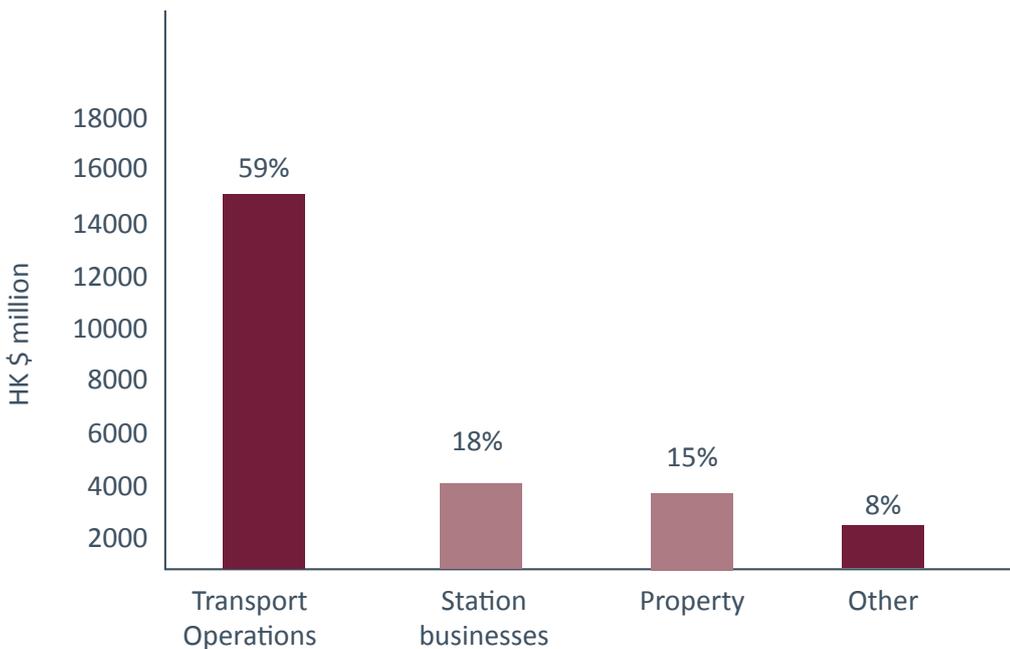


Figure 1: MTR revenue (2014)
 Source: MTR 2014 annual report

5.3 Options for funding

User charges

Charging the users of new infrastructure is likely to be a necessary component of any funding proposition. There is a key distinction to be drawn between direct users and indirect users. While the population arguably benefits from infrastructure, this benefit is paid for, or from, general taxation via a central grant. User charging looks at imposing a charge on individuals for the direct use of that infrastructure, over and above the contribution made through taxation.

Increasing these direct user charges is a primary option for funding future projects. Approximately half of national rail fares nationally are 'regulated', and therefore tied to the Retail Price Index (RPI). Under current Government policy no additional increase is imposed (RPI + 0 percent). For unregulated national rail fares, train operating companies (TOCs) set the fare in line with the wider transport market conditions. While annual fare rises are often contentious, they are relatively simple to implement and economic evidence shows passenger numbers are relatively inelastic to changes in price⁶⁸.

Outside of the national rail network, user charging for light rail and metropolitan transport is the primary funding method used to supplement central grants. Transport for Greater Manchester (TFGM) generated £11m in revenue surplus (after current financing costs) in 2014/15 which could enable supported borrowing for the next phases of the capital plan in Manchester⁶⁹. Similarly Crossrail 2's proposed funding package forecasts that the operating surplus generated largely through user charging can support approximately 11.6 percent of capital the funding required for the project over a 34 year period. This level of surplus is calculated on the basis of assumptions on passenger flows moving from current services to Crossrail 2 (including from national rail services), as well as consideration of increased passenger flows from population growth and other external factors.

Although revenue from national rail services would be removed with Crossrail 2, the scheme would unlock opportunity for long distance rail which would generate additional revenue to compensate.

Ring-fencing an increase in user charging therefore provides an easily implemented and stable income stream for future project funding. In the Crossrail 2 Funding and Financing Study this has been calculated as the net impact, taking into account the revenues taken away from franchised national rail services and TfL services in to Crossrail 2. The mechanism for securing this revenue has not been specifically detailed however it is anticipated that this would be an internal mechanism for TfL to maintain. Rail fares and the cost of transport are a policy decision, but could be used for projects such as Crossrail 2. The forecast operating surplus as outlined in the most recent Funding and Financing revision for Crossrail 2 (PWC, 2015) is £6.75bn over 35 years⁷⁰.

Fare Options

Within the funding report for Crossrail 2 analysis was undertaken of a London wide above inflation fare rises. This analysis highlighted that this option could raise substantial additional revenues for TfL. The baseline assumed TfL's business plan, of fares increasing annually at RPI + 1 percent until March 2021.

It was estimated that an additional 1 percent of annual fares increase above the current fare growth repeated for 4 years from 2030 would raise 8.0 percent of the project funding for Crossrail 2.

The use of fare increases is consistent with making the users that benefit from the investment (even if using the wider network rather than specific line) have a direct link into the repayment of the upfront costs of such infrastructure. As a potential variant to London wide fare increases, an option would be to increase the pricing of peak fares. Capacity issues during peak periods would allow this argument to be justified, especially compared to a blanket fare rise across London. Further economic and financial analysis would be required to assess the value of this option.

⁶⁸ City University London, The demand for long distance travel in Great Britain: some new evidence, January 2005

⁶⁹ Transport for Greater Manchester, Statement of Accounts for the Year Ended 31 March 2015

⁷⁰ TfL, Crossrail 2 Business Case, 2015

User Pays Revenue

The user pays mechanism for specific assets can be implemented in London including road projects. The DfT's National Policy Statement for National Networks outlines introducing road pricing to manage demand on the Strategic Road Network falls outside Government policy, but charging can be introduced as 'a means of funding new road capacity on the Strategic Road Network'⁷¹.

The Silvertown Tunnel is a proposed crossing of the River Thames. On 3rd February 2016 a submission for development consent was submitted to the Secretary of State for Transport following a public consultation. In addition a preliminary business case has been prepared⁷². Charging for use of the asset is justified for two reasons:

- managing demand on the asset; and
- contributing towards the cost of the asset.

In preparing the preliminary case a number of other options, including Mayoral Community Infrastructure Levy (CIL) and Government grant were considered, however user charging is the preferred option because it is also able to manage demand on the asset, and contribute towards broader policy goals of encouraging public transport use and improving air quality.

The present cost estimates are £920m for construction and £3.5m annually for operations operational, which also includes routine maintenance. At present there are no published forecasts for anticipated income, although a variable charge is being considered.

Broader indirect user charging for the road system sits with taxation on vehicles and fuel, with Vehicle Excise Duty (VED) and fuel duty being the key mechanisms by which car users are charged. Taking a precept from road taxes has been used as an infrastructure funding mechanism in other parts of the world. In the UK at present these taxes are not directly used for maintenance and investment in the road network, but instead are directed to the exchequer. Ring-fencing a portion of VED, based on where the vehicle is insured or registered, could form the basis for an element of infrastructure funding. This funding stream has been proposed by both the Institute of Civil Engineers, and in the London Finance Commission's 'Raising the Capital Report'. Similar to congestion charging or road tolling, it would be feasible to use these funds towards public transport projects such as Crossrail 2, rather than road network improvements. However, this would be a departure from established policy.

A number of other user charging mechanisms, including levies or taxes on visitors to international cities such as London, could be investigated further. For example:

- in Nottingham, a workplace car parking levy has been issued by the City Council with proceeds funding the tram extension in the city;
- hotel taxes are common in the USA and major European cities. Particularly in Paris and Barcelona these charges are used to maintain local infrastructure assets, rather than fund their construction. These are mentioned in the London 2050 Infrastructure Plan and Westminster and Camden local authorities have recently explored these funding streams in detail; and
- local Sales Taxes are widely used at State level in the United States to fund road infrastructure improvements. In Lake County, Florida, a sales tax set 1 percent higher than state tax is ring-fenced for use on local infrastructure, mainly road improvements⁷³. This is less likely to be applicable in the UK due to the current tax legislation.

⁷¹ Department for Transport National Policy Statement for National Networks, December 2014

⁷² Transport for London, Silvertown Tunnel Supporting Technical Documentation, October 2015

⁷³ Lake Country Florida Infrastructure Sales Tax Renewal, About the Sales Tax, 2015

Land value capture

Public bodies and local transport authorities have the opportunity to use the land it has access to through its partners to not only deliver value with regards to its direct objectives, linked to its vision for transport, but wider indirect benefits across business, housing, and other connected areas. This can be done through capturing the increasing value of land adjacent to the core development of the infrastructure.

The unearned value (increases in land value which otherwise profit private landowners cost-free) may be 'captured' directly by converting them into public revenue. Thus, value capture measures the positive outcomes of public investments, allowing public bodies to tax the direct beneficiaries of their investments.

Urban planners and finance officials are often interested in value capture mechanisms because:

- they offer a targeted method to fund infrastructure benefitting specific land; and
- such investments can, in some cases generate private investment in the area, which will more widely benefit the area (e.g., by providing employment opportunities, shopping and other amenities, and a more robust and diverse tax base).

The value of any given land can be determined by its proximity to various amenities (both public and private). Therefore when a new train station or service is provided, such as Crossrail 2, nearby land becomes more valuable.

Capturing that land value capture increase can be undertaken in four ways which we explore in turn:

- tax increment financing;
- special assessment zones (Enterprise Zones, business Improvement Districts, Stations);
- developer agreements; and
- direct involvement.

Tax Increment Financing

National Non Domestic Rates (NNDR) or business rates are charged to capture the value of the immediate infrastructure and services that organisations located in that area benefit from. Tax Increment Financing (TIF) has been developed as a model to subsidise upfront development which would not occur but for the intervention. This investment is then recovered through the incremental increase in business rates from future development of that land.

The risks associated with TIF are related to failure to complete the project and the variability of business rates over time. In the former, if the development does not proceed as forecast the borrower may be left with a liability they are unable to service. Equally, the re-setting of business rates is due to take place every five years, but it is unclear how this re-setting will be applied and thus it is difficult to forecast changes in rates. The latest business rates revaluation took place in 2008 and was implemented in 2010, with the next due for 2017. As such forecasting the recovery of the investment is difficult to anticipate.

Typically TIF is difficult to implement, though the main barriers as identified by the London Finance Commission are the setting of accurate tax baselines and clearing any borrowing against TIF within the prudential rules⁷⁴. The Commission argues that fiscal devolution to London would make this a quicker process to approve, with fewer restrictions on use.

⁷⁴ Travers, Tony, Raising the capital: the report of the London Finance Commission, London Finance Commission 2013

TIF has been widely used in the USA since 1970, in part due to the federal system operated in that country. In comparison, the UK market for TIF is comparably immature. In spite of this TIF is in place to fund the Northern Line Extension in London. TIF deals have also been implemented in Scotland where the Scottish Government has utilised its fiscal controls to implement TIF more widely than in England and Wales⁷⁵. Examples of its use in Scotland are:

- £80m City Centre regeneration project – Glasgow;
- £67m M9 motorway and flood defence funding – Falkirk;
- £79m town centre regeneration – North Lanarkshire; and
- £18.9m renewable energy projects – Argyll and Bute⁷⁶.

Potential benefits related to TIF include the opportunity to regenerate the wider area around a project and the potential for this indirect development to then proceed as investors' appetite increases in that area. Similarly TIF introduces the prospect that land that otherwise would remain vacant receives the catalyst required to kick-start development. For Crossrail 2, some of this uplift may fall outside of the proposed TIF zones (if inside the zone an increase in business rates would be used to fund the project). In this instance the economic benefits brought by the project would create a wider tax uplift for the Exchequer due to business creation and growth, outside of that modelled in the case for crossrail 2. It is these broader benefits that mean the higher cost 'Regional' route is preferred over the lower cost 'Metro' route.

Special Assessment Zones

An enterprise zone is a geographic area in which the market value of real estate is enhanced due to the influence of a public improvement and in which business taxes are ring fenced for the promoter to recover the costs of the public improvement. Infrastructure incentives and reduced regulation can also be used, if the statutory power exists, to attract investment and private sector interest into an area to increase land value and create jobs.

Risks attached to this zonal approval relate to the question of true benefit. There is still uncertainty over whether this approach creates truly 'new' economic activity, or simply displaced economic benefit congregating around new investment. In addition, the resetting of business rates as described above could have a negative impact in such a zone.

The TIF deal for the Northern Line Extension required the creation of an Enterprise Zone (EZ) around Nine Elms in south London. The creation of the EZ follows the proposed new stations in Battersea and Wandsworth Road and the EZ is required by statute to allow the business rates retention agreed in the TIF deal. The Nine Elms EZ, if retained after completion of the extension, would also have the power to grant discounts and tax breaks, as well as continuing to retain NNDR. Any extension of the agreement beyond the current life of the NLE scope would be subject to agreement with Government⁷⁷.

A similar approach is being considered for Crossrail 2 to enable the incremental business rates income to be collected in Kingston, Wimbledon, Victoria and Tottenham Court Road, though at present there has been no specific discussion regarding how powers of reduced regulation and other EZ benefits will be employed in these areas.

⁷⁵ The Scottish Government, Tax Incremental Financing, February 2013

⁷⁶ The Scottish Government, £1.5bn infrastructure investment, April 2014

⁷⁷ Ward, Matthew, Enterprise Zones, House of Commons Library, January 2016

Developer agreement

Local authorities have the ability to levy charges on developers in two ways. A Section 106 agreement otherwise known as a “planning obligation” is used to provide contributions to offset negative impacts caused by construction and development. Examples of contributions range from the provision of affordable homes and new open space to funding of school places or employment training schemes. The developer will either implement these or make payments to the council for them to be carried out. All Section 106 agreements must be relevant to the development they relate to, with the main purpose being to protect wider land values and contribute to the wider infrastructure need.

The second option is the CIL which is a charge raised per metre squared by local authorities in England on new development as a condition of planning consent. The CIL is used to fund local infrastructure to support the new developments. In London the Mayor has powers (under the Planning Act 2008) to introduce a London wide ‘Mayoral CIL’ to deliver local and sub-regional large scale transport infrastructure. This power is being used for Crossrail 1 and it would seem appropriate that a similar mechanism could apply to Crossrail 2 which based on the most recent projections is expected to be the second highest contributor of funding (16.9 percent) after the Business Rate Supplement (20.3 percent).

The mechanism is currently in place for Crossrail 1 and is expected to continue, with the Mayor choosing where to direct the funds. As with the Business Rates Supplement (BRS) this is easy to collect through local authorities.

The major risk with the CIL is that the revenue is directly linked to new developments within London which can change substantially with external economic factors. However, this is mitigated by the forecast growth of London’s population and the resilience of London-based developments to economic shocks (as seen from 2007 to present).

There is a balance to be struck on the level of CIL charged. Too low and it will not raise sufficient revenue. Too high and CIL may reduce potential new development or further increase the price of housing within London.

The current rates of Mayoral CIL vary across different London boroughs according to a zonal principal and applies to both new residential and non-residential development where the total floor area exceeds 100sqm. The Funding and Finance Report for Crossrail 2 suggests that Mayoral CIL and Section 106 could be merged. This appears a sensible recommendation based on the evidence from Crossrail 1, where the forecast CIL revenues were stronger than the Section 106 contributions. Any changes to the Mayoral rates would require an Examination in Public by an independent examiner, meaning there could be a time delay for receipt of this income stream to the project.

Criticism of Mayoral CIL is that it fails to effectively capture the ‘live’ value of new developments. This is a similar issue to revenue from Stamp Duty Land Tax (SDLT), where value is only captured at the point of sale for HM Treasury. There is currently no mechanism to capture the increase in value of properties as a result of local infrastructure development where the property is not a new development (CIL/Section 106) or where the property is not sold (SDLT). One option could be a levy on the increase in rental values, whereby the uplift year-on-year is captured. This may be a further option to be assessed for future infrastructure investments, though would most likely require wholesale change of housing and rental legislation to implement. An additional risk is that the level of developer contribution required may affect viability and become prohibitive to projects commencing if there is an economic slowdown. A report commissioned by Royal Institution of Chartered Surveyors’ Building Cost Information Service has introduced this as a problem outside of London⁷⁸.

⁷⁸ BCIS, Housing Development: the economics of small sites – the effect of project size on the cost of housing construction, August 2015

Government Led Development

A further option for funding development is for Government to take direct involvement in the capture of land value. Government led development could occur in two ways, firstly through the development of land that would have been taken over to facilitate the delivery of the infrastructure railway itself. For example sites to provide access, create work sites and provide storage facilities.

Some of this land may ultimately form part of the infrastructure but excess land, for instance land used as worksites during the construction phase has historically been subsequently sold and can provide additional funds for the project. This has been used for Crossrail 1, Bank Station Capacity Upgrade and is proposed for HS2. The consultation work is on-going for HS2, however to date approximately £272.4m of property has been purchased by the programme⁷⁹. The level of additional land value capture will only be demonstrated post-completion of HS2.

Secondly, fundamental policy changes and a different promoter vehicle could enable the Government to, in principle, acquire additional land outside of the strict boundary required for the construction of the railway itself to take advantage of the land value increases that would occur as a result of the increased public transport accessibility and a direct result of constructing Crossrail 2. This requires policy changes that would be separate and in addition to the Parliamentary Powers that would enable the Crossrail 2 scheme (railway only) to be consented, a Hybrid Bill or Development Consent Order under the Planning Act 2007. For example, the creation of a Development Corporation as discussed in section 4. DCs can be given powers to acquire land, secure funding, act as their own Housing Association, reclassify land for residential and commercial purposes and allow levels of densification which can help maximise the value of developments, but also powers to prepare masterplans with development plan status and to consent or refuse planning applications.

This approach is more innovative and would require fundamental policy changes to enable such land value capture. It has been used however, as an example by, the Olympic Park Legacy Corporation at the Queen Elizabeth Park at Stratford which was a DC, a benefit of which was to allow the public sector to raise funding and have more control over any housing constructed (i.e. affordable housing, specialist housing).

The scale of housing release contemplated specifically in relation to Crossrail 2 suggests that there could be substantial benefit in extending this model to direct control of the released land and to a development role in its delivery.

Early land acquisition or a programme of compulsory acquisition can be effective in both generating sufficient control to facilitate delivery of the land use change as well as the infrastructure, but it can also enable land value uplift to be captured by the promoter. One implication of this approach is with regard to cashflow, whereby an initial capital expense for the purchase is not repaid until nearly the end of the project. The more nuanced approach as outlined above (such as developer agreement) could allow a more front ended stream of revenue in to the project.

The risks from this mechanism are that the ultimate sales value is dependent on the economic cycle and London has a history of volatile prices, although over the long term the trend is upwards. The linkage to the economic cycle and definite project timescales make this source of funding difficult to predict and therefore finance against.

⁷⁹ Butcher, Louise, High Speed 2 (HS2) Phase 1, House of Commons Library, December 2015

Land Value Capture options

As detailed above, the London Mayor could establish a Mayor Development Corporation (MDC), which was permitted under the Localism Act 2011.

In addition to this 'core' option for Land Value Capture, is the ability to utilise Stamp Duty Land Tax. SDLT is a tax levied on property or land transactions in England and Wales, and has been reformed over the last 10 years to account for the house price inflation observed over the same period. SDLT is currently payable direct to the Treasury via HMRC. The Crossrail 2 Funding and Financing Study introduced the notion that an uplift in SDLT caused by the increased value generated by Crossrail 2 could theoretically be included in a broader land value capture mechanism.

This report also identified the possibility for devolution of fiscal authority over SDLT to the GLA, in order for it to be considered as a funding stream for projects in London, for example. In Scotland, SDLT has been replaced by Land and Buildings Transaction Tax (LBTT). A recent London First report, along with various other studies discussed below, note that devolution of property taxation should be a core future component of infrastructure funding. The broad argument is that this type of fiscal devolution would be offset by a reduction in central Government funding, thereby not harming the level of funding for the remainder of the UK but allowing London to have more control over its own revenue.

Local Taxation and Grants

The other area for raising additional funding relates to other taxation mechanisms and grants.

Business Rate Supplement

The Business Rate Supplement (BRS) has been successfully used on Crossrail 1 and under the Business Rate Supplement Act 2009, which allowed London boroughs to collect a maximum of 2 pence in the pound of rateable value to the rates multiplier. In London the levy applied to commercial properties with a rateable value of £55,000 or more, which equated to 20 percent of non-domestic properties in London.

This funding stream would appear to be replicable for future projects subject to the overall limit. It is easy to collect, with high collection rates and provides a steady income as unoccupied properties generally remain liable for Business Rates. Further changes to the maximum value of rateable value (currently £55,000), could be used to vary revenues from this source. The risks with this income stream is the maximum 2 pence has been earmarked for Crossrail 1, and without further legislation BRS for Crossrail 2 could not be used until the current BRS for Crossrail 1 has ended (forecast to be 2031). The supplement is continuous unless cancelled.

Any new BRS scheme for Crossrail 2 would currently need to ballot business ratepayers in London to approve an additional supplement to fund Crossrail 2. However, the proposed changes in legislation over business rates are likely to mean local areas have greater immediate control over how business rates are collected, retained and spent. As announced at the Conservative Party Conference in 2015, Local Authorities will be able to retain business rates collected, rather than the current model of collection and central redistribution. In the proposed new system of business rate collection and retention, no additional statute may be required for local authorities to a) raise a supplement and b) redistribute the proceeds of a supplement to a sub-national transport body or towards the NIC for redistribution. The question for London though is whether the business community would accept a further levy on top of the current 2 percent specifically for infrastructure.

Council Tax Levy

A levy on council tax is a core method of funding Combined Authorities and Transport Authorities across England. TfL currently receives approximately £6m per annum from council tax precept (in addition to £15.6m (2014/15) in charges to London Boroughs), whereas Transport for Greater Manchester (TfGM) received £195m in council tax levy in 2015/16. Introducing a levy on council tax, similar to BRS, has the potential to provide a significant revenue stream for future project funding. In 2014/15 approximately £3.4bn of council tax was collected by London boroughs meaning even a small percentage increase could contribute significant proportions to the funding profile of infrastructure promoter.

Alternatively, a precept could be charged on Council Tax across London specifically to fund large projects. This concept was implemented as part of the London 2012 Olympic funding package, whereby a precept over 10 years raised approximately £625m. Such a specialised increase in council tax has been allowed for social care and may provide London, or other regional areas, opportunity for a similar ring-fenced increase in Council Tax to be directed at supporting specific infrastructure projects.

As with fare increases, this is consistent with the principle of those who are the most likely beneficiaries of the development contributing to the cost of the infrastructure. It is noted that some core users of the new Crossrail infrastructure will pay their council tax outside the Greater London boundary and would therefore not contribute through the precept. One key benefit of the precept is that it should create a steady dependable flow of funding each year, though Council Tax collection is historically less dependable than business rates collection.

Other Sources

There are a number of other sources of funding outlined in the Funding and Finance Report on Crossrail 2 which could fund smaller proportions of the project including:

- Station Zone Value Capture – to capture increases in land around stations such as used for the Northern Line Extension which focussed on the redevelopment of Battersea Power Station and covers the Vauxhall, Nine Elms and Battersea Enterprise zone. Both the incremental Business Rate Income and Borough Community Infrastructure Levy have been assessed. Although the report for Crossrail 2 states this is not likely to be significant because of the limited link to major Central London stations that would be solely captured by this project; and
- Negotiated Contribution – whereby contributions are actively sought from private corporations and businesses with a vested interest along the corridor. The clearest examples on crossrail 1 are Canary Wharf, which contributed £150 million and Berkeley Homes. Other examples included the City of London and Heathrow Airport who together contributed approximately £500 million.

The impact of devolution?

The Crossrail 2 report also states that further devolution or hypothecation to the GLA of future growth in property tax income across London could be problematic, primarily due to the fact that income would be based on growth, starting at zero and rising up over time. In order for this to be a funding stream able to contribute to the revenue demands of Crossrail 2, devolution of such taxes would have to occur well in advance of the project commencement. Detailed analysis of this devolution would be required to assess whether such fiscal control could generate future funding revenue to Crossrail.

Funding Summary

Overall the funding sources identified in the Crossrail 2 Funding and Finance Report appear reasonable and in most cases have been used on other infrastructure projects. With the target of 50 percent funding from non-central government sources, a range of these options are likely to be required to fund Crossrail 2.

One of the challenges, will be dovetailing 'new' funding streams with those already in place for Crossrail 1, however, in principle sources such as BRS will have finished funding Crossrail 1 by the time the funding is required for Crossrail 2.

One of the key challenges, however, will be balancing 'new' funding streams with those already in place for Crossrail 1. For example, BRS has already been allocated to Crossrail 1 until 2031 which could provide challenges to Crossrail 2.

In addition, a number of significant funding sources require policy changes.

While a number of the options outlined above are open to any area in the UK (e.g. rail fare increases, tourist levy), London is at a significant advantage when it comes to decision-making required at a local authority level. The pre-existing TfL, GLA structure and relationship enables a simpler governance process when building a suite of funding options which will assist for the funding of large infrastructure projects.

London also maintains a more stable economic base than other areas of the UK. Seeking developer contributions is less volatile in London because of the increasing demand for commercial and residential property⁸⁰. Contributions from these developments can be relied upon over the medium to long term in London, whereas the economic base in other UK areas may not be so stable.

5.4 Financing

Generally with large infrastructure projects, the financing requirement is driven by the timing difference between costs being incurred, and the revenues being received. For the purposes of this report, therefore, financing can be considered to be how the costs of a project are met as they are incurred.

As noted in the previous sections, the funding revenues may be:

- annual and recurring, after the infrastructure is built and operational (e.g. user charges);
- annual and recurring, prior to as well as after the infrastructure is built (e.g. BRS or Council Tax precept);
- a one-off payment (e.g. land sales); or
- a series of one-off payments (e.g. receipts from a CIL).

The financing requirement to be funded from these streams will be driven by three main variables:

- size of the financing requirement, reflecting the capital costs of the scheme;
- the cost of the finance, reflecting the interest rate or cost of capital required by the source of finance, relative to other options; and
- the length of time over which the finance is repaid.

A large proportion of this financing is highly likely to be from the sources offering the lowest interest rates, effectively public sector borrowing based on public sector credit. In general these sources are accessed from central government departments or local authorities although the European Investment Bank may also have a role.

Private sector finance may be pursued as an option for certain projects or elements of projects. For example there is an established market for rolling stock leases in the UK. The main advantage of private finance is that, subject to structuring the transactions in a certain way to transfer certain risks related to construction, availability and demand, such finance is treated as off balance sheet for the public sector, which reduces the pressure on the public finances.

⁸⁰ JLL, Driving Forward – Will the momentum continue?, Property Predictions 2015

Ultimately the decision on the off balance sheet treatment lies in applying the Eurostat rules under the European System of Accounts 2010 (ESA10), which judges whether borrowing is within or outside of the public sector boundary for national accounts purposes, based on the risk transfer of the specific project. For example, toll roads lend themselves readily to alternative financing solutions as the existence of user charges leads them to be classified as 'off balance sheet' for the public sector, and hence not count towards UK Government borrowing constraints.

Private finance generally comes at a higher cost, due to the private sector needing a return on their equity to reflect the additional risks taken on. This generally accounts for a small proportion (1 percent to 10 percent) of the overall funding. We would also note that for some of the larger infrastructure projects envisaged by the NIC, a purely private sector solution may be beyond the capacity and scale of the market to deliver because of the levels of risk involved. Studies have shown that the cost of transferring risk is prohibitive particularly construction risks of large complicated projects which have previously included Edinburgh Trams and Eurotunnel. Each project would require to be assessed separately and as noted above elements of any specific project may lend itself to a specific financing route⁸¹.

Further streams of finance may be sought from more innovative and new sources. The creation of bonds from government bodies is an options for raising relatively cheap levels of finance from investors, but these are usually dependant on a government guarantee, which would be politically sensitive and may be counted as on the public sector balance sheet. Municipal bonds have also been put forward by local authorities in the UK, though the development of a formal agency has been slow. The UK Municipal Bond Agency established its formal framework in January 2016. Warrington Borough Council successfully issued a £50m CPI linked bond in 2015, at a coupon of 0.846 percent and under a Moody's rating of Aa2. The coupon is limited to 3 percent and the bond formed part of a broader financing package from PWLB and reserves⁸².

This type of financing would be available for London projects, such as Crossrail 2, though it will ultimately be secured against Government assets. TfL has significant experience of issuing bonds to finance capital expenditure and refinance existing debt packages. TfL's current bond issue stands at £3bn.

Alongside the announcement of the NIC was the creation of British Wealth Funds, an attempt to harness the financial assets of local government pension fund pots to finance infrastructure projects in the UK. For London, two potential funds exist; London Collective Investment Vehicle (London CIV) and the London Pension Fund Authority/Lancashire combined pool which pioneered the model, though in reality any project could feasibly access finance from any British Wealth Fund.

An area where public funding can be used to assist in leveraging private sector investments is the UK Guarantees Scheme. Initially a response to the aftermath of the credit crunch where the long-term funding required by infrastructure projects effectively dried up, the UK Guarantees Scheme was established to provide the bridge between public and private finance. Central government will support projects through a financial guarantee to pay the private sector financier the capital and interest due on its loans should the project itself not have the cashflows to cover them. The scheme has currently been extended to December 2016.

TfL has experience of UK Guarantees through the Northern Line Extension⁸⁴. For the Northern Line Extension, the Government has arranged an unconditional and irrevocable financial guarantee to pay the scheduled principle and interest on borrowing of £750m. The payment to the Government for the guarantee has been set at the market rate. The key benefit is the use of Government credit rating against the project to secure a lower cost of finance⁸⁵.

⁸¹ Crawford, Joe, Infrastructure & Risk: Identification, Management & Transfer of Risk by HM Treasury, Cambridge Judge Business School, February 2014

⁸² Warrington Council, Warrington Borough Council enters bond market, August 2015

⁸³ Transport for London, Borrowing Programme, January 2014

⁸⁴ HM Treasury, Transparency data UK Guarantees scheme: table of prequalified projects, March 2015

⁸⁵ Allen & Overy, The UK Guarantees Scheme for Infrastructure Projects, 2013

It may be that the use of a UK Guarantees style “wrap” of debt could be used to make the cost of financing as efficient as possible. Recent market soundings have highlighted clearly that the strength of the guarantee provided to the financier will be critical in driving private sector appetite for funding infrastructure and the cost of such funding.

The Funding and Finance Report states there is no apparent reason why Crossrail 2 would be any more suitable than Crossrail 1 for private financing, where a minority of the project would be privately financed. It is also noted that Crossrail 2 would not meet any of the investment requirements of the ‘wall of money’ from sovereign wealth funds, infrastructure funds and pension funds, without government guarantees, due to the size and risk profile of the project.

The three areas identified for private finance relate to:

- selling the revenue stream that is forecast from Crossrail 2 either upfront or over the life of a concession period as is followed on rail franchises. It should be noted that currently TfL retains the revenue risk on their rail franchises;
- rolling stock finance which has a history in the UK and was originally being used for Crossrail 1 but was stopped due to concerns over the required timeframe; and
- using a Regulated Asset Base (RAB) model as used for the Thames Tideway Tunnel with bespoke features. For this to apply to Crossrail 2 would require an independent regulator for investment plans and pricing. The RAB model is normally used to deal with maintenance and renewal of an establish network rather than a whole asset. The Shaw Report into Network Rail may provide further guidance on how this will be applied to the wider Network Rail assets.

Financing Summary

Large project financing is dependent on a number of core issues such as the quantum of financing needed and the level of risk involved in the specific projects. Typically these are decided on a project-by-project basis. However a key strategic issue relates to the treatment of financing on the government balance sheet and the guarantees expected by the private sector financiers.

Appendix B provides further analysis of the assumptions used within the Crossrail 2 Funding and Financing Study.

5.5 London and the regions

The above funding and financing options have been considered with applicability to London and Crossrail 2. When assessing the ‘fit’ with the rest of the UK it becomes clear that London holds a number of advantages which allows easier implementation of such funding mechanisms.

Firstly, political and administrative structures already exist within London to support a number of the core funding elements that have been discussed above. Devolution of fiscal powers, levying of certain tax elements, or the widespread implementation of fare increases, CILs or other mechanisms have, to some extent, already been delivered via the Mayor’s office, GLA or TfL. Economically, there is greater security around London-based proposals. The sustained economic growth of London when compared to the rest of the UK is well documented, as is the value of property, land and other assets situated within the London boroughs. When assessing the security of future revenue streams against a borrowing requirement, there is likely to be a higher level of certainty attached to London based models than other areas of the country.

City Deal funding packages were set up in part as a response to the imbalance in funding from Central Government to cities outside of London. While they have facilitated the development of some more innovative funding methods for infrastructure (primarily the earn-back/gain-share models), London has already developed beyond the application of these mechanisms. The evidence from Northern Line Extension and Crossrail 2 is that of a decreasing central Government presence, whereas City Deals represent an attempt to lock-in funding for longer periods in the ‘core cities’ and beyond. Ultimately the reflection on city regions is that they would like to emulate the mechanisms London has already been able to develop.

This is evidenced by Manchester City Council’s submission to the London Finance Commission, which argues that London has had a disproportionate level of capital funding from central Government in the past, and that any fiscal devolution subsequently offered to London to offset these historic grants should also be offered to Manchester and other UK cities⁸⁶.

It is worth noting that City Deals have been only one point of significant change for UK cities. Since their introduction, City Deals have been built on by devolution agreements and the development of Combined Authorities in city regions. Both of these have had an impact on the funding and financing of projects, though as yet there are no significantly innovative funding proposals for infrastructure in city regions that are not already being utilised in London.

Further details on the specific arrangements for a number of recent City Deals are provided in Appendix C.

In summary, while the funding options outlined in this report are theoretically possible to implement outside of London, and will certainly be considered as sub-national transport bodies are established, the speed and relative ease with which they could be applied will vary. London is undoubtedly at an advantage, and as demonstrated with Crossrail 1 and Crossrail 2, this advantage is producing innovative options for serious consideration by the rest of the UK, and the world.

5.6 Funding & Finance Conclusions

Ultimately funding and financing envelopes will be formed on a project-by-project basis, and will be driven by the type and quantum of funding required for the project. Crossrail 1 and 2 are prime examples which demonstrate how other funding mechanisms have and can be used to reduce the requirement for significant levels of central Government funding. The current Crossrail 2 funding forecast demonstrates the importance of both the users pay and land value capture mechanisms to funding large infrastructure projects. The extent to which these mechanisms are acceptable for politicians and the public is a matter for further investigation. The devolution of further fiscal powers, as identified in a number of other reports, would form a key part of these discussions in the future. The extent to which future fiscal policy can impact infrastructure funding should be a key part of the on-going work of the Commission.

⁸⁶ Manchester City Council, Statement of Evidence to the London Finance Commission, 2011

A Glossary

Term	Definition
Additionality	An impact arising from an intervention is additional if it would not have occurred in the absence of the intervention.
Agglomeration	The benefits that firms obtain by locating near each other.
Agglomeration Economies	The benefit when lower transport costs bring firms closer together, resulting in lower unit costs and higher productivity.
Appraisal	The process of defining objectives, examining options and weighing up the costs, benefits, risks and uncertainties of those options before a decision is made.
Benefit Cost Ratio (BCR)	Is an indicator, used in the formal discipline of cost-benefit analysis, that attempts to summarise the overall value for money of a project or proposal
Business Rate Supplement (BRS)	The Business Rate Supplements Act 2009 makes provision for county councils, unitary district councils and the Greater London Authority to levy a supplement on the national non-domestic rate (or business rate). Authorities will be able to use the proceeds to fund additional investment aimed at promoting the economic development of local areas.
C2C	c2c operates services on the London, Tilbury and Southend Railway line from London Fenchurch Street to the northern Thames Gateway area of southern Essex.
Central Activities Zone (CAZ)	As defined by the GLA's Central Activities Zone Supplementary Planning Guidance. It is broadly the West End, the City of London and Nine Elms corridor.
CIL	Community Infrastructure Levy
City Deal	In December 2011 the Government announced a new process of City Deals which has seen Government work with different cities to agree a series of tailored 'City Deals'. These consist of new powers for cities and/or innovative projects to unlock growth in each area.
Combined Authorities	Combined authorities are a legal structure that may be set up by local authorities in England. They can be set up with or without a directly-elected mayor. The relevant legislation is the Local Democracy, Economic Development and Construction Act 2009 and the Cities and Local Government Devolution Act 2016.
Compulsory Purchase Order (CPO)	Compulsory purchase powers are provided to enable acquiring authorities to compulsorily purchase land to carry out a function which Parliament has decided is in the public interest. A Compulsory Purchase Order (CPO) is a vehicle for compulsorily purchasing land based on a specific Act of Parliament.
Cost Benefit Analysis (CBA)	Analysis which quantifies in monetary terms as many of the costs of a proposal as feasible (financials), including items for which the market does not provide a satisfactory measure of economic value (non-financials).
Crossrail , Crossrail 1	High capacity rail service under construction, between Heathrow and Reading west of London, through central London to Shenfield and Woolwich Arsenal in the east.
Crossrail 2	Proposed high capacity rail service running from south west London through central London to north east London.
DfT	Department for Transport

Term	Definition
Development Corporation	Development corporations are bodies set up in England and Wales by the UK government charged with the urban development of an area, outside the usual system of Town and Country Planning in the United Kingdom.
Discounting	A method used to convert future costs or benefits to present values using a discount rate.
Discount rate	The annual percentage rate at which the present value of a £, or other unit of account, is assumed to fall away through time.
DLR	Docklands Light Railway
Duty to Co-operate	The Localism Act, 2011, placed a legal duty on local planning authorities, county councils in England and public bodies to engage constructively, actively and on an ongoing basis to maximise the effectiveness of Local and Marine Plan preparation in the context of strategic cross boundary matters.
Economic Appraisal	See appraisal. This specifically takes into account the economic costs. Also used as a general term to cover cost benefit analysis (CBA).
Enterprise Zones	Enterprise Zones are areas in which Government incentives such as tax concessions are offered to encourage business investment. The government has designated 24 areas across England as Enterprise Zones.
ETCS	European Train Control Systems
Five Case Model	A systematic framework for the development and the presentation of the business case over time (Strategic Outline Case, Outline Business Case and Full Business Case).
Fully Business Case (FBC)	The third and final part of business case development, it should provide all the information needed to support a decision to award a contract and commit actual funding, and should provide a basis for the necessary project management, monitoring, evaluation and benefits realisation.
GRIP	Governance for Railway Investment Projects - the way Network Rail manage transport projects
Gross domestic product (GDP)	Gross domestic product (GDP) is the monetary value of all the finished goods and services produced within a country's borders in a specific time period
Gross Value Added	Gross Value Added (GVA) is an indicator of wealth creation, measuring the contribution to the economy of a specified investment in economic activity.
HS2	High Speed 2 (HS2) is the planned high-speed railway linking London, Birmingham, the East Midlands, Leeds, Sheffield and Manchester.
Local Development Order (LDO)	Local Development Orders (LDOs) are made by local planning authorities and give a grant of planning permission to specific types of development within a defined area. They remove the need for developers to make a planning application to a local planning authority.
Large Scale Transport Infrastructure	Transport Infrastructure of national importance that is of sufficient scale and cost that requires a bespoke funding method to finance delivery.

Term	Definition
Local Growth Fund	From March 2015 the majority of future funding for local transport will be in the Local Growth Fund. Strategic Economic Plan. Strategic Economic Plans of Local Enterprise Partnerships (LEPs) are used as the basis of negotiating a Local Growth Deal with Government which determines the level of funding LEPs receive from the Local Growth Fund.
Market Value	The price at which a commodity can be bought or sold, determined by the interaction of buyers and sellers in a market.
Mayoral CIL	The Mayoral Community Infrastructure Levy (CIL) applies to most new major developments in London granted planning permission on or after 1 April 2012. The Levy is currently being used to fund Crossrail 1.
National Infrastructure Commission (NIC)	An independent body that enables long term strategic decision making to build effective and efficient infrastructure for the UK.
National Policy Statement (NPS)	National Policy Statements (NPSs) are produced by Government on major national infrastructure matters. They give reasons for the policy set out in the statement, and must include an explanation of how the policy takes account of Government policy relating to the mitigation of, and adaptation to, climate change. They include the Government's objectives for the development of nationally significant infrastructure and they include any policies or circumstances that Ministers consider should be taken into account in decisions on infrastructure development.
Net present value	The discounted value of a stream of either future costs or benefits. The NPV is used to describe the difference between the present value of a stream of costs (NPC) and a stream of benefits.
Opportunity Area	Opportunity Areas are London's major source of brownfield land which have significant capacity for development – such as housing or commercial use - and existing or potentially improved public transport access.
Opportunity cost	The value of the most valuable alternative uses or the cost of something in terms of an opportunity forgone.
Optimism bias	The demonstrated systematic tendency for appraisers to be over-optimistic about key project parameters, including capital costs, works duration and benefits realisation.
Option Appraisal	The process of defining objectives, examining options and weighing up the costs, benefits, risks and uncertainties of those options before a decision is made.
NNDR	National Non Domestic Rates
Net present value (NPV)	The discounted value of a stream of either future costs or benefits. The NPV is used to describe the difference between the present value of a stream of costs (NPC) and a stream of benefits.

Term	Definition
Outline Business Case (OBC)	The second stage of business case development, providing a fuller assessment of strategic fit, option appraisal, achievability, assumptions about costs, benefits, risks and funding. The OBC should determine the preferred option in terms of the level and form of service provision, and should recommend a particular procurement route.
RAB model	Regulated Asset Based Model
Risk	The likelihood (measured by its probability) that a particular event will occur.
RPI	Retail Price Index
P80 estimate	The probability of the final cost of a project being less than the P80 cost is 80%
PPP	Public Private Partnerships
QRA	Quantitative Risk Assessment
SDLT	Stamp Duty Land Tax
SDO	Special Development Order
Section 106 agreement	Planning obligations under Section 106 of the Town and Country Planning Act 1990 (as amended), commonly known as s106 agreements, are a mechanism which make a development proposal acceptable in planning terms, that would not otherwise be acceptable. They are focused on site specific mitigation of the impact of development.
Spatial Planning	The methods used by the public sector to influence the distribution of people and activities in spaces of various scales.
Strategic Business Case (SBC)	The first phase of business case development, which introduces the basic project concept and contains enough detail to support an informed decision on whether to proceed to an Outline Business Case. It should include a preliminary assessment of strategic fit, options, value for money, affordability and achievability.
Sub-surface lines	London Underground lines: Circle, District, Metropolitan and Hammersmith & City lines
TIEP	Transport Investment and Economic Performance
TIF	Tax Incremental Financing
tph	Trains per hour
VED	Vehicle Excise Duty
VNEB	Vauxhall Nine Elms Battersea (VNEB) Opportunity Area
webTAG	The Department for Transport's Transport Appraisal Guidance document website. Readily used as a term to describe the guidance itself.
WCML	West Coast Main Line

B Review of Crossrail 2 Funding Assumptions

Introduction

The following assumptions relate to the Crossrail 2 Funding and Financing Study, dated 27 November 2014. In this section we have outlined the basis of the economic assumptions used and comment on where variances or changes in the assumption base may be possible. For clarity, the assumptions outlined in appendices A, B & C to the Crossrail 2 Funding and Financing Study will be referred to as Base Assumptions.

We note that this review of assumptions constitutes a desktop exercise only, as we have not accessed the models used to compile the figures in the study or access to TfL or their advisers to perform a detailed review. We also note a revision of initial assumptions was undertaken in 2015, with the outputs presented in a report dated 19 June 2015. The contents of this report have been reviewed here, and commentary on movement from the base assumptions has been made along with our view on the evidence base and application of these changes.

Appendix C

Appendix C presents the core assumptions used throughout the model. At the macroeconomic level, table B.1 outlines the core assumptions and commentary used in the Funding and Financing Study. This is followed by our revised assumptions and commentary.

For the specific funding sources assessed in the report we have examined assumptions on an exception basis. Where an assumption has not been covered by this report it can be considered, based on the details provided to be a reasonable assumption at this stage of the Crossrail 2 programme.

As a core component of the funding envelope proposed, forecast project generated revenues are based on capturing the proceeds from net operating cashflows. These are based on a fare rise assumption of RPI + 1 percent until 31/3/2021 and RPI + 0.5 percent thereafter. This runs contrary to real terms rail freezes subsequently announced by the Government for the life of this Parliament, and was subsequently revised in July 2015 report⁸⁹. The impact of this change is reflected in Table 4.3. Following 2020 the annual fare growth is modelled as 0.5 percent per annum. This is a relatively conservative growth estimate when considering the long term fare growth of 1 percent above RPI since 2010, and average fare increases of 4.5 percent before then.

It is worth noting the sensitivity of this revenue stream to fare freezes, if fares were to be frozen at RPI +0 percent over the life of Crossrail 2, this core funding stream drops to only 6.8 percent of the funding envelope.

Index	Original Rate	Original Commentary	Revised Rate	Revised commentary
Retail price Index (RPI)	2.70%	Agreed assumption with TfL- the basis is the Bank of England's long-term CPI target of 2.00% plus 0.70% to reflect the differential between CPI and RPI	3.30%	Revised assumption to reflect DfT requirements from the webTAG databook.
Tender Price Index (TPI)	3.50%	Estimate based on the long term average of the BCIS TPI All in Price Index (3.38% p.a. from Feb-1985 - Nov-2013)	5.60% ⁸⁷	We note that TPI at 3.5% (as used in the original and revised study) is low, particularly in reference to London. The higher levels of construction inflation observed in the capital could be better reflected in this assumption. The BCIS TPI All in Price Index (3.5%) reflects a national-level, long term indexation and we would suggest an index more reflective of the cost of construction in London.
House Price Index (HPI)	4.70%	This assumption was agreed based on discussions with Carter Jonas and TfL	4.70%	This reflects a reasonable long-term average, though noteworthy is the latest annual change in HPI of 12.4% ⁸⁸

Table B.1: Crossrail 2 Macroeconomic assumptions

⁸⁷ Tender Price Indicator 2nd Quarter 2015, Gardiner & Theobald

⁸⁸ House Price Index, Land Registry, 26 February 2016

⁸⁹ Department for Transport's settlement at the Spending Review, 2015

A similar issue exists with the London-wide fare rise, where the latest announcement on fares introduced a freeze for 2016 only⁹⁰. Crossrail 2 responded by revising down their revenue assumptions by 14 percent. In addition to the baseline fare rise assumption, we note no contingency has been included in the modelling. This runs contrary to other revenue assumptions where contingency has been applied as shown in Table B.2.

The business rate supplement is designed to commence following the end of the modelled business rate supplement requirement for Crossrail 1 funding in 2031. Any slippage of this funding stream for Crossrail 1 could have an impact on the envelope for Crossrail 2. The forecast is based on two factors, stock and chargeable rate. Firstly an annual growth rate of 0.25 percent to reflect additional stock becoming rateable every year. Secondly, revenue from rates is forecast to increase at RPI + 0.75 percent per annum, rolled up and

applied every 5 years upon revaluation. This approach appears suitably prudent, particularly after removing 10 percent for contingency. Based on these assumptions we would anticipate the suggested levels of BRS to be deliverable as a funding package. The key caveat to this would be any change to the rating system which is currently being lobbied for by various business groups to level the playing field between traditional businesses and internet based businesses.

The July 2015 study revises the BRS supplement upwards, meaning it becomes the largest contributor to the proposed envelope. This is a result of implementing the recommended long-term RPI assumptions of 3.3 percent as outlined in Table B.1.

At the quoted levels, BRS offers the project flexibility to cover any potential shortfalls in funding. An extension of the supplement for 3 years would add a further £6.1bn, for example.

Funding Sources	Funding & financing study (Nov 14)	Contingency (Nov 14)	Central Financial Case (June 15)	Contingency (June 15)
Net operating surplus	20.0%	0%	11.6%	0%
Mayoral CIL	11.6%	20%	16.9%	20%
Business rate supplement	15.2%	10%	20.3%	0%
Council tax precept from 2017/18	1.5%	10%	1.4%	10%
Over-station development	1.9%	N/A	6.3%	N/A
Total % funded	50.2%		56.5%	
Total % after national rail extraction	42.6%		43.6%	

Table B.2: Potential funding streams for Crossrail 2 with contingency
Source: TfL, Crossrail 2 Business Case, 2015

⁹⁰ TfL Press Release, November 2015

The Mayoral CIL modelled is based on 'fixed' assumptions that are currently in use for funding Crossrail 1. As such we believe the levels of fund put forward to be deliverable on this basis. We note that current legislation does not permit borrowing against CIL, therefore legislative change would be required to deliver this as a revenue stream to support capital borrowing. Furthermore, the collection rates for Mayoral CIL are dependent on the levels of development enabled by Crossrail. If investment fails to follow the infrastructure then there is a risk to securing the required revenue.

For Borough CIL the assumptions used are complicated by the promise to retain 50 percent of CIL generated from Crossrail 2 related development, only when increases in Borough CIL receipts (resulting from new development in the station zone) outstrip the requirements of local service delivery. Given the current challenges facing local government and their infrastructure investment levels it is difficult to predict under which circumstances Borough CIL would be claimed by Crossrail 2. Aside from this point, Borough CIL assumptions are based on the actual rates chargeable currently in each Borough and include the original Tender Price Index (TPI) rate which appears to be set at a reasonable level compared to the latest information. These conclusions are reflected in the July 2015 report, where Borough CIL is removed from the proposed envelope of funding.

Station Zone Value Capture, or Incremental Business Rate Income is based on a mixture of trend information and actual assumptions, and therefore the revenue base appears to be broadly achievable. The key assumption is with regards to the 100 percent retention of income. This would require approval from HM Treasury to implement. Given the 30 percent contingency, the revenue modelled reflects a real terms 70 percent retention of income from the proposed Station Zones, which appears to be deliverable. The study notes the difficulty in securing a baseline position from which the incremental income can be measured. This has proven to be too high a barrier for similar funding agreements in the UK, for example in Manchester a 'Earn-back' value capture model was abandoned due to difficulties agreeing baseline information.

The Olympic precept gives the precedent for implementing the Council Tax precept suggested in the report, although rolling this forward for an additional 20 years may prove to be contentious. The assumptions used to calculate the figures used are based on a standard methodology for calculating Council Tax. A key risk will be the extent to which other charges are levied on Council Tax. Currently a 2 percent precept can be introduced to fund social care, which will raise the base level considered in the report and therefore adjust the level of funding modelled. Further de-centralisation of Council Tax setting may also damage these assumptions, though the control offered via the Greater London Authority may mitigate this risk.

In summary the assumptions used for the Crossrail 2 Funding and Financing Study, in respect of the funding sources, appear to be based on reasonably deliverable assumptions. Since the report was produced core assumptions such as RPI and TPI have flexed from the base position, but these changes will take place up until the completion of the project and it will be the variance from the assumptions that will cause either under or overspend. The levels of contingency built in to revenue assumptions, alongside the optimism bias within the expenditure assumptions reflects this time-based risk. Assumptions were revised in July 2015 and the updates appear to reflect the most relevant up to date information available. Further investigation could be undertaken in relation to the TPI rate used as more work could be done to understand long term construction inflation for London-based projects.

The most significant assumptions within the study are politically driven, namely that revenue streams used for Crossrail 1 can be extended and transferred to fund Crossrail 2, and that business rates growth can be retained exclusively for use on the project. Furthermore the assumption that the Olympic precept be continued for a further 20 years is a significant ask from Londoners. The major outstanding assumption not reviewed in this report is with regards to project generated revenues from passenger numbers, and we would recommend specialist investigation and due diligence in to this major funding stream.

C Review of City Deals

Introduction

City Deals have been the primary mechanisms for specific infrastructure funding outside of London. Below we have considered the first wave of City Deals, all signed in July 2012. Table C.1. demonstrates the variety of funding packages agreed with Government. This Table demonstrates Government's funding contribution to the first wave of City Deals, be it direct funding or support for more innovative methods (e.g. Earn Back, Tax Increment Financing).

Of these initial deals, all but the Greater Birmingham deal involved an element of transport improvement, though as itemised in Table C.1, the Department for Transport direct funding makes up only a part of these improvements, though these deals, struck directly between local authorities and the Department for Transport represented breakthrough changes in the funding of transport.

The remainder of funding is contributed from 'local' sources, meaning from local authority capital funds, usually borrowed prudentially.

The core developments brought by City Deals for the financing and funding of transport and infrastructure are outlined in the case studies below. We have focused on Leeds, Manchester and Bristol, as these are the deals with the most strongly defined transport infrastructure elements.

City Deal	TIF funding (£m)	Business rate retention (£m)	DfT 10 year funding (£m)	Earn Back (£m)	Other grants (£m)	Total (£m)
Greater Birmingham	-	-	-	-	16	16
Bristol City Region	-	450	81	-	2	534
Leeds City Region	-	-	183	-	10	193
Liverpool City Region	-	-	-	-	82	82
Greater Manchester	-	-	199	900	9	1,108
Newcastle City Region	92	-	-	-	7	99
Nottingham City Region	8	-	-	-	29	37
Sheffield City Region	33	-	114	-	46	193
TOTAL	133	450	577	900	200	2,260

Table C.1: Recent city deals funding summary

Leeds City Region⁹¹

The agreement of 10 year transport funding as part of the 2012 City Deal was the first step for Leeds City Region in developing a more stable transport funding model. It was supplemented in 2014 by an agreement to create the West Yorkshire Plus Transport Fund ("WY+TF"), a product of the City Deal, Local Growth Fund settlement and an agreement by local authorities to match funding through a committed levy, as shown in Table C.2. The total value of WY+TF is £1bn, which has been allocated to a range of rail, road and other public transport projects to be delivered between 2015 and 2025.

This funding package relies on 78:22 split between central and local contributions, with no private contributions expected. Contributions from Highways England and Network Rail are anticipated on a project-by-project basis, but these do not form part of the substantive funding package for the Region.

Forty two percent of the funding package is Local Growth Fund contribution, but this part of the package is payable from 2021/22. Unlocking this funding will be dependent on Leeds demonstrating the economic impact of the projects delivered between 2015 and 2021.

Period	Funding Source	£m	%
2015/16 – 2020/21	Local Growth Fund	180	18
2015/16 – 2024/25	DfT funding (as above)	183	18
2021/22 – 2034/35	Local Growth Fund – contingent on economic impact	420	42
2015/16 – 2034/35	Matched local authority levy funding	217	22
Total		1,000	100

Table C.2: Leeds City deal funding

⁹¹ West Yorkshire plus Transport Fund - Programme and Cost Review, 2014

Greater Manchester Combined Authority

The primary innovation in the Greater Manchester City Deal was the introduction of an ‘earn-back’ funding model, agreed in 2012. Under this arrangement, Greater Manchester Combined Authority would retain a portion of additional tax revenue generated by investment. The earn-back model required HM Treasury to set a clear tax baseline and growth projection, whereby any tax generated in excess of the baseline projection could be retained and reinvested in regional infrastructure. The cap on retained tax revenues was £900m over 30 years.

By 2014 the complexity of the model was decided to be prohibitive to implement and instead ‘earn-back’ was replaced by a ‘gain-share’ model, whereby capital grants are payable from government to the region every five years. The value of payment is based on the assessment of an appointed panel, who are employed to appraise the economic impact of investments to date⁹². Similar models of infrastructure funding have been used in City Deals with Greater Cambridgeshire and Glasgow and as part of the Leeds devolution agreement.

Bristol

The Bristol City Deal also included funding from the Department for Transport over ten years, and this is primarily to fund a series a transport ‘devolution’ projects in the city. These include:

- delivery of a Greater Bristol Metro;
- enabling greater control over the Bus Rapid Transport network; and
- discussions over greater rail planning powers in the West of England

One of the planned outcomes from this transport devolution work is the desire to recycle operational financial savings made across the West of England Bus Rapid Transport network back in to projects in the West of England. At present any savings need to be returned to Government⁹³.

This City Deal has been since superseded by the West of England devolution proposal, which requests £1bn of Central Government guaranteed funds to invest in cross-authority infrastructure projects. A ‘payment-by-results’ mechanism would be enabled to allow West of England to repay the borrowing from increased tax revenues, brought by economic growth⁹⁴.

⁹² Devolving responsibilities to cities in England: Wave 1 City Deals, July 2015

⁹³ Bristol City Region City Deal, West of England Local Enterprise Partnership

⁹⁴ Bristol City Council, Full Council Agenda, September 2015