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RAIL

The Case for East West Rail, Western Section Phase 2

Moving Britain Ahead



December 2018

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1. Executive summary

- 1.1 The purpose of this report is to summarise why the government supports the construction, and operation of railway services, on East West Rail Western Section Phase 2 (EWR Phase 2). The report has been prepared by the East West Railway Company (EWR Co)¹ and the Department for Transport (DfT). It has two main parts:
 - Chapter 2 summarises the strategic case for the scheme;
 - Chapter 3 summarises the economic case, providing results of an economic appraisal of EWR Phase 2.
- 1.2 In the summer of 2018 Network Rail commenced enabling works on EWR Phase 2 using its existing powers. Subject to necessary consents, Network Rail expects to start more significant civil and engineering works in 2019, with the aim of completing works on Phase 2 in 2024. Phase 2 is a key part of completing the wider EWR programme, a rail link between Oxford and Cambridge. EWR Co will be consulting on route options between Bedford and Cambridge in early 2019.

Strategic Case

- 1.3 When complete, EWR will provide a direct rail link between Oxford and Cambridge and join up key towns and cities across the corridor².
- 1.4 EWR Phase 2 will reinstate and upgrade railway lines to enable new train services to run between Oxford and Milton Keynes, between Oxford and Bedford and between Milton Keynes and Aylesbury. Phase 2 will follow on from the successful delivery of Phase 1 of the Western Section which upgraded the line from Oxford to Bicester Village, allowing the introduction of a new London Marylebone to Oxford service in December 2016³.
- 1.5 EWR strategic objectives include improving public transport connectivity⁴. It is also a key part of realising the economic potential of the Oxford-Cambridge Arc (the Arc)⁵. It complements the government's wider programme of investment in the Arc, including the 'Oxford to Cambridge Expressway', promoted by Highways England under the Roads Investment Strategy⁶.
- 1.6 EWR has long been promoted and supported by local organisations, including the East West Rail Consortium of local authorities, local enterprise partnerships and others, and by central government. Government re-confirmed its support for the

¹ EWR Co is a non-departmental public arm's length body set up by the government to accelerate the East West Rail project, see also <https://www.gov.uk/government/organisations/east-west-railway-company>

² The Cambridge-Milton Keynes-Oxford corridor, is referred to by the National Infrastructure Commission, government and others. Its geographic definition is the same as the Oxford-Cambridge Arc, footnote 5

³ The service to Oxford city centre commenced in December 2016. The line from Oxford Parkway to Bicester had been completed earlier, Chiltern Railways started an Oxford Parkway to London Marylebone service in October 2015.

⁴ The full set of EWR Phase 2 objectives are set out at paragraph 2.33.

⁵ The area between Oxford and Cambridge, incorporating the ceremonial county areas of Oxfordshire, Buckinghamshire, Bedfordshire, Northamptonshire and Cambridgeshire forms a core spine that the government recognises as the Oxford-Cambridge Arc.

⁶ <https://www.gov.uk/government/collections/road-investment-strategy-post-2020>

scheme at Budget 2018 saying it had “Committed funding for proposed transport infrastructure for the Arc, including... £1 billion for the Western Section [Phase 2] of East-West Rail⁷.”

Economic Case

- 1.7 The benefit cost ratio (BCR) of EWR Phase 2 is assessed to be between 1.3 (likely low value for money) and 2.4 (likely high value for money)⁸ depending on assumptions made about economic and housing growth in the Oxford-Cambridge Arc. The lower end of the range reflects baseline forecasts of population, housing and employment growth consistent with the DfT National Trip End Model (NTEM)⁹. The upper end of the range represents a ‘higher growth’ scenario which reflects the National Infrastructure Commission (NIC) vision, supported by the government, of up to one million new homes across the Arc by 2050¹⁰.
- 1.8 The benefits quantified in the BCRs presented in this report include transport user benefits and some wider economic impacts in line with DfT’s transport appraisal guidance (WebTAG)¹¹.
- The majority of the quantified benefits in this report relate to the direct transport impacts of the scheme, **the transport user benefits**. These include improved connectivity and journey times for rail users and benefits related to a reduction in travel by car, compared to the future situation without EWR Phase 2. Changes in expected emissions from cars and rail vehicles are also quantified and included in the transport user benefits.
 - **Wider economic impacts**¹² are additional to the direct transport user benefits. They include improvements in productivity through agglomeration – having the effect of bringing people and businesses closer together through improved connectivity and journey times.
- 1.9 It is also likely that EWR (Phase 2 and the complete programme) will bring other benefits to the Arc. These tend to be harder to quantify, some involve estimating changes in land-use as a result of EWR. These sorts of potential impacts, not quantified in this report, include¹³:
- Enabled development: housing, or commercial development (or redevelopment), which is enabled as a result of the scheme.
 - Other wider effects on labour markets, investment and supply chains, these are also areas where EWR has the potential to generate benefits that are beyond those in the transport market.
 - Freight benefits: EWR is being built to be able to accommodate rail freight. Phase 2 is likely to provide additional opportunities and cost savings for moving freight

⁷ Government response to ‘Partnering for Prosperity: a new deal for the Cambridge-Milton Keynes-Oxford Arc’, page 3, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/752040/Government_response_to_Partnering_for_Prosperty_a_new_deal_for_the_Cambridge-Milton_Keynes_Oxford_Arc.pdf

⁸ In line with DfT value for money categories as set out in the DfT value for money framework

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/630704/value-for-money-framework.pdf

⁹ NTEM version 7.2 which forecasts the growth in trips by place up to 2051 based on projections of population, employment, housing, car ownership and trip rates. <https://data.gov.uk/dataset/11bc7aaf-ddf6-4133-a91d-84e6f20a663e/national-trip-end-model-ntem>

¹⁰ Budget Speech November 2017 <https://www.gov.uk/government/speeches/autumn-budget-2017-philip-hammonds-speech>

¹¹ <https://www.gov.uk/guidance/transport-analysis-guidance-webtag> including Rail Appraisal Unit A1.3 and Wider Economic Impacts Unit

¹² Described as ‘Level 2’ impacts in WebTAG, Unit A2.1. Transport user benefits are sometimes described as ‘Level 1’ impacts.

<https://www.gov.uk/government/publications/webtag-tag-unit-a2-1-wider-economic-impacts-may-2018>

¹³ Many of these additional wider economic impacts are described in WebTAG Unit A2.1 including those that involve land-use change which are described as ‘Level 3’ impacts

by rail, which has the potential to deliver additional direct benefits, lower costs to freight users, and indirect benefits by removing some freight traffic from the roads.

- 1.10 DfT and EWR Co will continue to consider the wider range of benefits and impacts of EWR and will continue to work across government on how EWR will help support and enable central and local government plans for growth in the Arc.
- 1.11 In addition to its longer connectivity and other benefits (set out above), the construction of EWR Phase 2 has the potential to support jobs in the region and beyond. The East West Rail Alliance (procured by Network Rail to build EWR Phase 2) have estimated they will directly support up to 900 on-site construction jobs in 2021. There will also be additional jobs supported in planning and designing the railway and delivering rail and signalling systems, rolling stock construction and operating the railway. The Alliance is also undertaking a range of activities to support the development of skills and job opportunities in local communities and in promoting science, technology, engineering and mathematics (STEM) projects in schools and colleges.

2. The Strategic Case

- 2.1 East West Rail Phase 2 is intended to facilitate economic growth, new housing and employment opportunities in the Oxford-Cambridge Arc through the provision of improved rail connectivity.

The Scheme

- 2.2 When complete, the EWR programme will provide a direct rail link between Oxford and Cambridge and join up key towns and cities across the corridor.
- 2.3 EWR Phase 2 (shown in Figure 2-1) reinstates and upgrades railway lines to enable new train services to run between Oxford and Milton Keynes, between Oxford and Bedford and between Milton Keynes and Aylesbury. EWR Phase 2 will follow on from the successful delivery of Phase 1 of the Western Section which upgraded the line from Oxford to Bicester Village, allowing the introduction of a new London Marylebone to Oxford service in December 2016¹⁴.

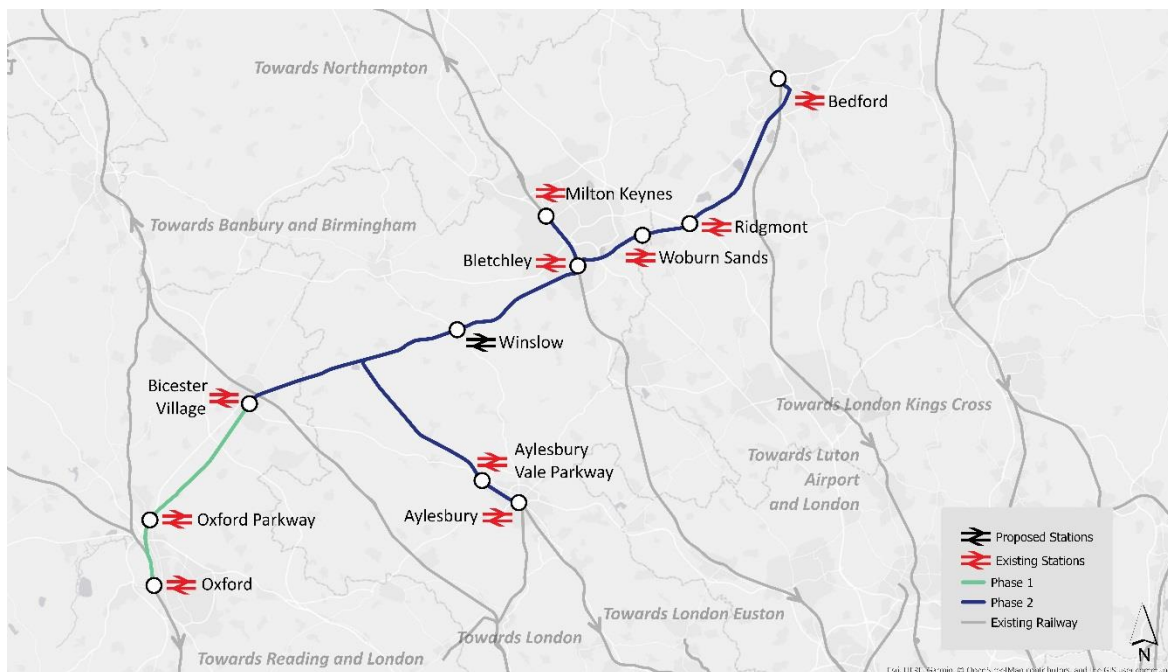


Figure 2-1 - EWR Phase 2 Map

Source: EWR Co

- 2.4 Figure 2-2 shows the additional train services that are expected to run following the opening of EWR Phase 2. They consists of:
- 2 passenger services per hour between Oxford and Milton Keynes

¹⁴ The service to Oxford city centre commenced in December 2016. The line from Oxford Parkway to Bicester had been completed earlier, Chiltern Railways started an Oxford Parkway to London Marylebone service in October 2015.

- 1 passenger service per hour between Oxford and Bedford
- 1 passenger service per hour between Aylesbury and Milton Keynes

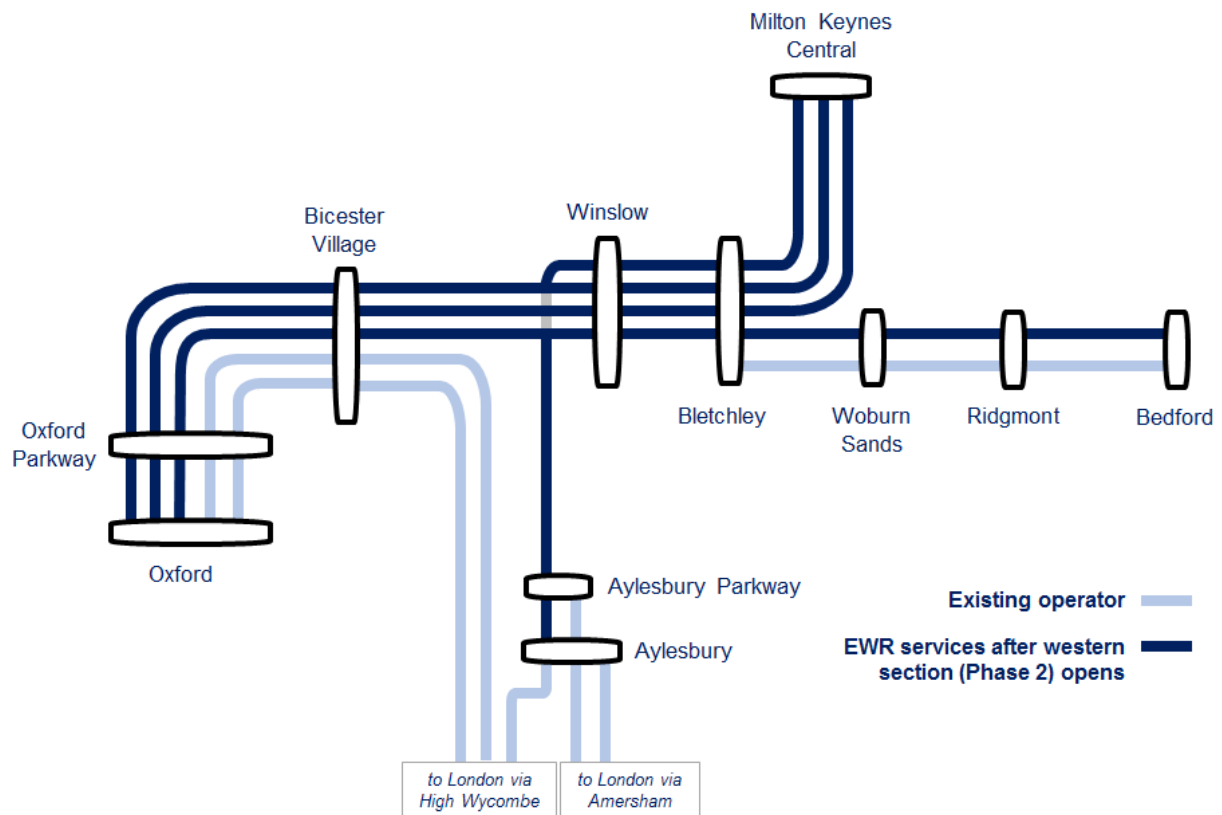


Figure 2-2 - Planned EWR services (per hour) after completion of EWR Phase 2

Source: EWR Co

2.5 The planned Phase 2 rail services will:

- Provide new direct connections, for example, between Oxford and Milton Keynes;
- Add to the frequency of services between stations that already have a rail service (like Bicester to Oxford and Bletchley to Bedford) and;
- Improve opportunities to interchange onto north-south rail lines, for example, for Winslow and London via Bletchley.

2.6 Stations will get between 1 and 4 new EWR rail services per hour in each direction under Phase 2 plans, as follows:

- 4 at Winslow and Bletchley;
- 3 at Oxford, Oxford Parkway, Bicester Village and Milton Keynes Central;
- 1 at Aylesbury, Aylesbury Parkway, Woburn Sands, Ridgmont and Bedford.

2.7 Once the entirety of the EWR programme between Oxford and Cambridge is completed, additional services will be added, yet further enhancing rail connectivity on the corridor. This is planned to include through services between Oxford and Cambridge as well as additional services between Bletchley and Cambridge.

The strategic case for investment in EWR

- 2.8 In July 2017, the DfT published its Transport Investment Strategy¹⁵, setting out the government's priorities for transport investment and how it takes investment decisions to:
- Create a more reliable, less congested, and better connected transport network that works for the users who rely on it;
 - Build a stronger, more balanced economy by enhancing productivity and responding to local growth priorities;
 - Enhance our global competitiveness by making Britain a more attractive place to trade and invest;
 - Support the creation of new housing.
- 2.9 EWR (Phase 2 and the overall programme) supports the delivery of all of these priorities by delivering a new rail corridor linking the key economic centres between Oxford and Cambridge, facilitating new employment and housing opportunities and supporting regeneration, development and redevelopment schemes in the area.
- 2.10 The government also asked the National Infrastructure Commission (NIC) to consider how to maximise the potential of the Cambridge-Milton Keynes-Oxford corridor as a single, knowledge-intensive cluster that competes on a global stage, protecting the area's high-quality environment, and securing the homes and jobs that the area needs¹⁶.
- 2.11 The NIC published its final report in November 2017 and identified that EWR, along with the proposed Oxford-Cambridge Expressway, "will enhance connectivity across the arc, expanding the labour markets of key towns and cities" and "can play a key role in tackling the arc's housing crisis, unlocking major new development locations and enabling transformational growth around existing towns and cities¹⁷."
- 2.12 Also in November 2017 the government published its Industrial Strategy White Paper, setting out its vision to drive productivity improvements across the UK¹⁸. Page 232 of the White Paper states that:
- "The corridor containing Cambridge, Milton Keynes and Oxford has the potential to be the UK's Silicon Valley. Two of its universities are consistently ranked in the world's top four, it competes for international high-tech and science investment, and it contains nationally significant industry concentrations such as information technology, life sciences, automotive engineering and professional services. Estimates by the National Infrastructure Commission (NIC) suggest that, with the right actions, annual output of the corridor could increase by £163bn per annum by 2050 – approximately doubling the growth expected to happen without government intervention.
- In the Autumn Budget [2017], the government announced a vision for the corridor to stimulate economic growth. This includes an ambition for one million homes by 2050, starting with a housing deal with Oxfordshire comprising a government investment of up to £215m to fund local infrastructure in return for up to 100,000 homes in the area

¹⁵ Transport Investment Strategy, DfT (2017) <https://www.gov.uk/government/publications/transport-investment-strategy>

¹⁶ <https://www.nic.org.uk/our-work/growth-arc/>

¹⁷ NIC (2017) Partnering for Prosperity: a new deal for the Cambridge-Milton Keynes-Oxford Arc, page 8 <https://www.nic.org.uk/wp-content/uploads/Partnering-for-Prosperty.pdf>

¹⁸ Industrial Strategy: Building a Britain fit for the future (2017) <https://www.gov.uk/government/publications/industrial-strategy-building-a-britain-fit-for-the-future>

by 2031. And the government is investing in the rail and road infrastructure needed to boost productivity across the corridor and support the homes the area needs.”

- 2.13 Alongside Budget 2018, the government published its response¹⁹ to the NIC Partnering for Prosperity report where it confirmed:
- Its support of the NICs ambition to build up to one million high quality homes by 2050 to maximise economic growth of the Oxford-Cambridge Arc.
 - The fact it has designated the Arc as a key economic priority, recognising the opportunity to amplify the Arc’s position as a world-leading economic place. The Arc is already home to 3.3 million people, supports 1.8 million jobs and contributes £90 billion of Gross Value Added (GVA) to the UK economy each year²⁰.
 - Its support of the NIC finding that in order to deliver the full economic potential of the Arc, there needs to be an integrated approach to the planning and delivery of infrastructure, homes and business growth within it.
 - The government also demonstrated its commitment to investment to support this level of ambition, including in relation to proposed new road and rail links, including £1 billion for EWR Phase 2 (Western Section)²¹.
- 2.14 In summary, the strategic case for EWR relates to its potential to facilitate **economic growth** in the Arc, in part by helping to address potential **housing** and **transport** barriers, but also by offering new opportunities. The sections below elaborate on these three themes.

Economic growth and the role of EWR

- 2.15 The corridor is home to a high concentration of world leading research facilities and internationally significant business clusters, with a skilled workforce and track record for innovation and entrepreneurship²².
- 2.16 Oxford and the immediate surrounding area is known as the Science Vale and is home to a number of bioscience and medical technology centres, as well as telecommunications, computer hardware, engineering and electronics firms. Milton Keynes is home to a number of major financial and professional services companies, along with some major high performance technology and motorsport companies²³.
- 2.17 The combination of innovation, entrepreneurship and highly-skilled workers in the Arc has enabled the towns and cities to become some of the most productive and fastest growing in the UK, (see Figure 2-3).

¹⁹ Government response to ‘Partnering for Prosperity: a new deal for the Cambridge-Milton Keynes-Oxford Arc’ https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/752040/Government_response_to_Partnering_for_Prosperty_a_new_deal_for_the_Cambridge-Milton_Keynes_Oxford_Arc.pdf

²⁰ Central Bedfordshire Council 2018 <http://www.centralbedfordshire.gov.uk/news/august/growth-corridor-partners-unite-at-mipim.aspx>

²¹ Government response to ‘Partnering for Prosperity: a new deal for the Cambridge-Milton Keynes-Oxford Arc’

²² NIC (2017) Partnering for Prosperity: a new deal for the Cambridge-Milton Keynes-Oxford Arc <https://www.nic.org.uk/wp-content/uploads/Partnering-for-Prosperty.pdf>

²³ NIC (2017) Partnering for Prosperity: a new deal for the Cambridge-Milton Keynes-Oxford Arc, page 20 <https://www.nic.org.uk/wp-content/uploads/Partnering-for-Prosperty.pdf>

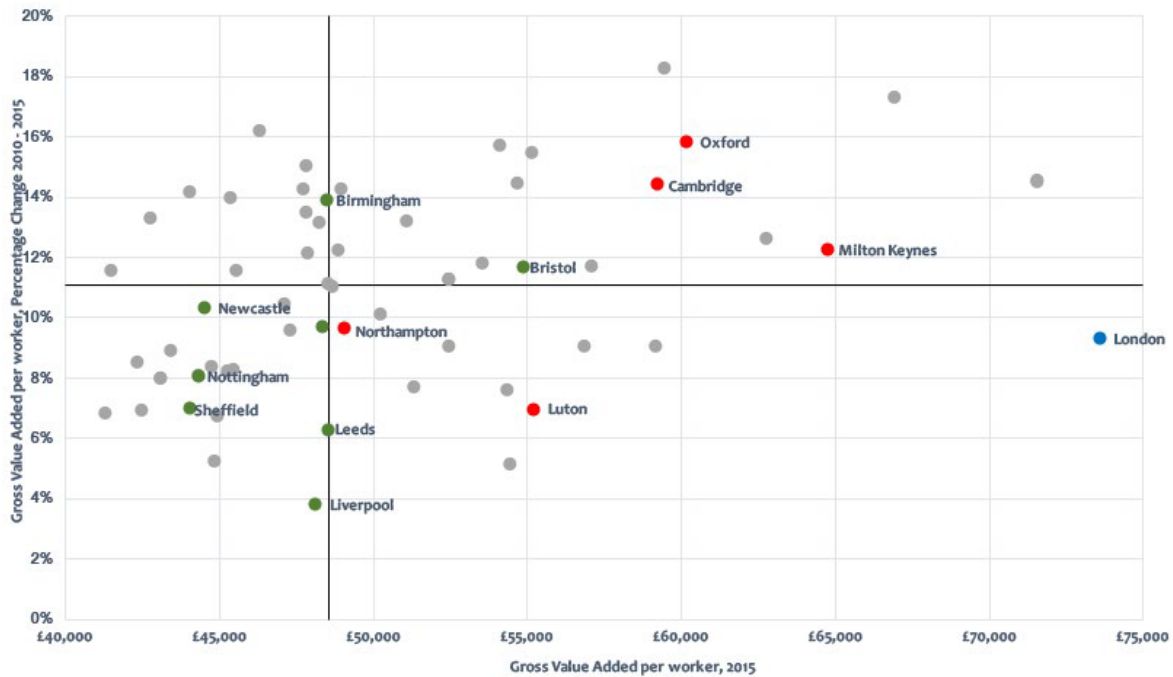


Figure 2-3 - Fast growing and highly productive cities

Source: Centre for Cities, published by NIC (2017)

- 2.18 In order to continue to support that growth the NIC recommended that “Government should progress work on East West Rail, the expressway and new settlements through a single co-ordinated delivery programme²⁴”. In its response to the NIC, the government endorsed this recommendation and confirmed it had “established a cross-Whitehall Programme to take an integrated approach to the planning and delivery of infrastructure, homes and business growth in the Arc.”
- 2.19 The NIC found that removing the constraints to growth that result from the undersupply of housing in particular (covered below) “could support a step change in the arc’s economic performance and make a significant additional contribution to national output....supporting around 1.1m new jobs and increasing economic output by £163bn per annum²⁵.”

Housing and the role of EWR

- 2.20 The Arc as a whole has experienced considerable growth in population from 2.7m people in 1990 to 3.3m in 2014. The NIC’s report outlines that the economic success of the Arc has led to a demand for homes which is not currently being met by supply. The undersupply of new homes has contributed to high house prices and low affordability for both home ownership and future housing needs. The ratio of median house prices to household earnings is 12:1 in Oxford and together with Cambridge, with a ratio of 13:1, the two cities are some of the least affordable in the country²⁶

²⁴ Recommendation 1a, NIC (2017) Partnering for Prosperity: a new deal for the Cambridge-Milton Keynes-Oxford Arc <https://www.nic.org.uk/wp-content/uploads/Partnering-for-Prosperity.pdf>

²⁵ NIC (2017) Partnering for Prosperity: a new deal for the Cambridge-Milton Keynes-Oxford Arc, which quotes Cambridge Econometrics and SQW (2016), Cambridge, Milton Keynes, Oxford, Northampton Growth Corridor - Final Report for the National Infrastructure Commission

²⁶ Savills, 2016 – The Property Market within the Cambridge – Milton Keynes – Oxford Corridor – Final Report p23

similar to London²⁷. This issue extends beyond the major towns and cities where across parts of Buckinghamshire, Oxfordshire and Bedfordshire, house prices can be around ten times the average salary²⁸.

- 2.21 The NIC found, “there is powerful evidence that house prices are already diminishing firms’ ability to attract employees. Workers are being priced out of local housing markets, restricting firms’ access to labour and impacting on their competitiveness. Global businesses within the arc have told the Commission that, had they realised the impact that employees’ housing costs would have on their business they may have located elsewhere. Others may yet choose to do so. This is as much an issue for high-tech firms and universities seeking to attract, recruit and retain globally mobile talent, as it is for public sector agencies looking to recruit key workers. These difficulties in accessing labour are exacerbated by poor east-west transport connections²⁹”.
- 2.22 Removing the constraints resulting from the under supply of housing, facilitated by new infrastructure including EWR Phase 2, will help support the Arc to achieve its economic potential, in part by enabling more people that want to live and work in the Arc to do so and thereby increasingly labour supply, helping business and organisations to grow by keeping them competitive. For the Arc to realise this potential, the NIC estimates that it will require a population growth of around 1% per year, which translates into a population increase of between 1.4 and 1.9 million by 2050³⁰.
- 2.23 The NIC estimate that between 23,000 and 30,000 new houses a year till 2050 would be required in the corridor as a whole to support the Arc’s transformational growth potential. The lower estimate would be likely to meet the needs of the corridor’s own future workforce requirement, with the higher estimate required to offset the impact of growth and under-delivery of homes in neighbouring land-constrained markets such as London³¹.
- 2.24 In contrast, between 2012 and 2015, the average number of homes built each year in the Arc was 12,250, with a slight increase to 14,300 in 2016-17³². This is about half the level the NIC estimate is required to help secure the corridor's transformational economic growth potential.
- 2.25 The government has agreed an ambitious Housing Deal with Oxfordshire that will result in a significant increase in housing. The government is continuing to explore the opportunities for further housing deals across the Oxford-Cambridge Arc³³. EWR will be an important enabler to accelerate development and re-development by improving connectivity and unlocking land for development. It is an integral part of realising the government’s ambition to see up to one million high quality homes built across the Arc by 2050 to maximise its economic growth.

²⁷ MHCLG provisional 2013 data, 9:1 for Outer London and Oxford, 10:1 for Inner London and Cambridge

<https://data.gov.uk/dataset/6af32488-47fc-4fa4-a247-b3d1e83a51b2/ratio-of-median-house-price-to-median-earnings>

²⁸ NIC (2017) Partnering for Prosperity: a new deal for the Cambridge-Milton Keynes-Oxford Arc, page 24 <https://www.nic.org.uk/wp-content/uploads/Partnering-for-Prosperty.pdf>

²⁹ NIC (2017) Partnering for Prosperity: a new deal for the Cambridge-Milton Keynes-Oxford Arc <https://www.nic.org.uk/wp-content/uploads/Partnering-for-Prosperty.pdf>

³⁰ Cambridge Econometrics and SQW (2016), Cambridge, Milton Keynes, Oxford, Northampton Growth Corridor – Final Report for the NIC

³¹ Savills (2016) The Property Market within the Cambridge – Milton Keynes – Oxford Corridor – Final Report

³² DCLG (2017) – Live Table 256: Housebuilding: permanent dwellings started and completed by tenure 2016-17

³³ Government response to ‘Partnering for Prosperity: a new deal for the Cambridge-Milton Keynes-Oxford Arc’

Transport and the role of EWR

2.26 Rail patronage has more than doubled over the last 20 years to 1.71 billion in 2017/18 (from 846 million in 1997/98)³⁴. This reflects the essential role Britain’s railways continue to play in supporting economic growth by enabling the safe, fast and efficient movement of passengers and goods into, and between, major economic centres and international gateways in an environmentally sustainable way.

2.27 Even without an east-west link there has been strong growth in rail travel in the Arc. Background rail demand growth in towns and cities which will be connected by EWR Phase 2 (including Oxford and Milton Keynes) has been 3.6% per year over the last 10 years, slightly higher than the national average of 3.4%³⁵.

However, at present the corridor is not served by high-quality, east to west transport links, with journeys between the key economic centres often long and impractical. Many of the rail journeys EWR Phase 2 will enable aren’t currently feasible without interchanging and travelling much further, travelling from Oxford to Milton Keynes via Coventry or London for example. This is in contrast to existing radial routes, where the existing economic centres all have regular train services to London, all with journey times within an hour.

2.28 The journey time savings between newly connected towns have the potential to be considerable. Figure 2-4 shows that the time saving is particularly noticeable, where journey times between Oxford and Bedford and Aylesbury and Milton Keynes have the potential to be more than halved.

Journey	Current Rail Journey Time (National Rail)	East West Rail Journey Time
Oxford – Milton Keynes	1h 19m	42m
Aylesbury - Milton Keynes	2h 28m	38m
Oxford – Bedford	2h 22m	1h 6m

Figure 2-4 - Current and future indicative rail journey times

Source: National Rail Enquiries, and LeighFisher (modelled EWR Phase 2 timetable)

2.29 Meanwhile, traffic growth in the Arc is forecast to continue to grow strongly³⁶. EWR Phase 2 provides additional connectivity in its own right, but it will also help alleviate some congestion and traffic between places where people don’t currently have a convenient rail option.

2.30 The lack of integrated transport infrastructure through the corridor has a direct impact on its ability to function as a single, integrated economic area. Without enhanced

³⁴ ORR rail usage statistics, <http://dataportal.orr.gov.uk/displayreport/report/html/a10e3c7b-7766-40ae-a87a-14c56cf85a63>
³⁵ Compound annual growth rate, LeighFisher analysis of MOIRA data, 2007-2017. This compares to a national average of 3.4% from ORR Statistics (2007/08 to 2017/18) <http://dataportal.orr.gov.uk/displayreport/report/html/a10e3c7b-7766-40ae-a87a-14c56cf85a63>
³⁶ Highways England, <http://assets.highwaysengland.co.uk/roads/road-projects/Oxford+to+Cambridge+expressway/Oxford+to+Cambridge+Expressway+Corridor+overview+booklet.pdf>

transport infrastructure, the corridor is unlikely to realise its potential as a globally competitive, knowledge intensive economic cluster³⁷.

2.31 There are also wider transport issues that extend beyond the infrastructure limitations of the Oxford – Cambridge corridor, for example:

- **Freight connectivity** - EWR could provide additional opportunities and potential cost savings for moving freight by rail, some of which could be re-directed away from the busy radial routes serving London where some capacity might be better used to enhance overcrowded passenger services.
- **London capacity** – many east-west rail journeys across the corridor can only be made at present by travelling into and back out of London, and transferring using the Underground, for Aylesbury to Milton Keynes, and Oxford to Bedford. This is potentially inconvenient for passengers. It also places pressure on London-bound capacity which would be otherwise freed up through the provision of a direct east-west service.

Strategic objectives for EWR Phase 2

2.32 In 2017 DfT, working with National Rail, updated the strategic objectives for EWR Phase 2 drawing on the themes highlighted above and by the NIC, including the opportunity for the railway to improve local connectivity and serve as a driver of economic growth and new housing. The objectives of the railway are to:

- Improve east-west public transport connectivity through rail links between Oxford, Bicester, Bletchley and Bedford/Milton Keynes, and between Aylesbury, Bletchley and Milton Keynes;
- Meet initial forecast passenger demand through new and reliable train services;
- Stimulate economic growth, housing and employment through new and reliable train services;
- Contribute to improved inter-regional passenger connectivity and journey times;
- Maintain current capacity for rail freight and appropriate provision for anticipated future growth;
- Consider and plan for future demand and economic growth; and
- Provide a sustainable transport solution to support economic growth in the area.

How EWR Phase 2 meets the strategic objectives

Improve east-west public transport connectivity through rail links between Oxford, Bicester, Bletchley and Bedford/Milton Keynes, and between Aylesbury, Bletchley and Milton Keynes and meet initial forecast passenger demand through new and reliable train services.

2.33 In contrast to strong north-south radial links extending from London, east-west trips across the corridor are difficult, slow and impractical but will be improved by EWR

³⁷ NIC (2017) Partnering for Prosperity: a new deal for the Cambridge-Milton Keynes-Oxford Arc <https://www.nic.org.uk/wp-content/uploads/Partnering-for-Prosperity.pdf>

Phase 2. As a result, commuting between key towns and cities on the corridor is almost non-existent and the area does not function as a single labour market³⁸.

2.34 The scheme and the planned rail services it will facilitate are described from paragraph 2.2, and shown in Figure 2-2 above.

Stimulate economic growth, housing and employment through new and reliable train services

2.35 EWR Phase 2 will support the creation of new homes and communities along the line of route and will support regeneration, development and redevelopment schemes.

2.36 The project is supported, particularly through the participation of the East West Rail Consortium, by the local authorities who are working in conjunction with housing developers to plan for the provision of new housing along the route.

2.37 In its 2017 report the NIC identified the East West Rail project as part of a vital opportunity to support the area's future success. This report was endorsed in the 2017 Autumn Budget and again at the 2018 Budget when the government formally responded to the NIC recommendations and restated its support for the project.

2.38 The sections above (including those on the economy and housing in the Arc) outline how EWR will be an important enabler to accelerate development and re-development by improving connectivity and unlocking land for development. It is an integral part of realising the government's ambition to see up to one million high quality homes built across the Arc by 2050 to maximise its economic growth.

Contribute to improved inter-regional passenger connectivity and journey times

2.39 The lines to be upgraded by EWR Phase 2 will connect to the Great Western network at Oxford, the Chiltern Mainline at Bicester, the London to Aylesbury line at Aylesbury, the West Coast Main Line at Bletchley and the Midland Mainline at Bedford.

2.40 By virtue of connecting these key lines, the new rail services to operate on East West Rail, whilst consisting of an initial primarily local service, will facilitate interchange between each route which will significantly shorten the journey times between a number of destinations; many of which, where travel is currently only possible via time-consuming interchange at London as shown in Figure 2-4.

Maintain current capacity for rail freight and appropriate provision for anticipated future growth

2.41 The existing operational rail infrastructure set for upgrade as part of EWR Phase 2 is currently used by freight, primarily conveying household waste to the landfill site and energy from waste facility located at Calvert, Buckinghamshire. EWR Phase 2 will retain the current freight capacity utilised by these services; as well providing additional opportunities and cost savings for moving freight by rail, making possible new freight flows through the increased inter-connectivity between main lines.

2.42 The railway will be built, in terms of loading capability and clearance, to accommodate current flows but also to enable potential freight growth which can operate over the line.

Consider and plan for future demand and economic growth

2.43 Given the potential for housing growth along the line upon the commencement of the initial train service, there is a strong need to consider and plan for future demand.

³⁸ NIC (2017) Partnering for Prosperity: a new deal for the Cambridge-Milton Keynes-Oxford Arc, page 25 <https://www.nic.org.uk/wp-content/uploads/Partnering-for-Prosperty.pdf>

Network Rail has worked with the DfT and EWR Co to develop Phase 2 in a way that the right balance is taken between the initial capital costs and appropriate provision being made for future growth. The signalling is being designed to accommodate future service levels post 2027. New stations are being designed for future growth and existing stations are being assessed to ensure capacity is sufficient for future growth.

- 2.44 Once the link between Oxford and Cambridge is completed, additional services will be added further enhancing rail connectivity on the corridor. This is planned to include through services between Oxford and Cambridge as well as additional services between Bletchley and Cambridge and train lengthening.

Provide a sustainable transport solution to support economic growth in the area

- 2.45 It is intended that EWR Phase 2 will positively contribute to tackling climate change by minimising the potential adverse impacts of growth through providing opportunities for a more sustainable means of travel than alternatives.

Local policy support

- 2.46 An east-west rail link has been on the agenda of local authorities in the region since the original rail connection was closed in 1967. It was closed despite high levels of local opposition and the impending large population influx resulting from a new town (Milton Keynes). There have been many subsequent studies commissioned to look at re-opening the lines, most commissioned by local organisations including the East West Rail Consortium (EWRC).
- 2.47 The EWRC was set up in 1995 with the objective of promoting and securing a strategic railway connecting East Anglia with Central, Southern and Western England. The EWRC brings together local authorities, Local Enterprise Partnerships (LEPs) and most recently England's Economic Heartlands Strategic Authority (EEHSA) as well as NR, the DfT and stakeholders from across the South East and East of England. The EWRC remit is to ensure that the full potential of the EWR link is realised in support of the delivery of economic growth, new employment opportunities and housing.
- 2.48 The policy of local authorities and stakeholders recognises the important role of transport in developing local communities; and opportunities for housing and job creation across the Arc. This is set out in their local plans and policies summarised in Annex A.

3. The Economic Case

3.1 The benefit cost ratio (BCR) of EWR Phase 2 is assessed to be between 1.3 (likely low value for money) and 2.4 (likely high value for money)³⁹ depending on assumptions made about economic and housing growth in the Oxford-Cambridge Arc. The lower end of the range reflects baseline forecasts of population, housing and employment growth consistent with the DfT National Trip End Model (NTEM)⁴⁰. The upper end of the range represents a 'higher growth' scenario which reflects the National Infrastructure Commission's vision, supported by the government, of one million new homes across the Arc by 2050⁴¹.

Approach

3.2 The cost and benefits quantified in this report are appraised in line with the approaches set out in HM Treasury Green Book⁴² and, specifically, in line with the approach to transport appraisal set out in DfT transport appraisal guidance (WebTAG)⁴³. The benefits included in the BCRs include transport user benefits and some wider economic impacts.

- The majority of the quantified benefits in this report relate to the direct transport impacts of the scheme, the **transport user benefits**. These include improved connectivity and journey times for rail users and benefits related to a reduction in travel by car, compared to the future situation without EWR Phase 2. Changes in expected emissions from cars and rail vehicles are also quantified and included in the benefits.
- **Wider economic impacts**⁴⁴ are additional to the direct transport user benefits. They include improvements in productivity through agglomeration – having the effect of bringing people and businesses closer together through improved connectivity and journey times.

3.3 In WebTAG agglomeration is explained as follows, "Agglomeration economies: Productivity is affected by the density of economic activity; this is one of the reason for the existence of cities and specialised clusters, such as financial hubs. The productivity impacts may occur within or across industries, termed localisation and urbanisation economies respectively. Agglomeration economies are externalities and

³⁹ In line with DfT value for money categories as set out in the DfT value for money framework https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/630704/value-for-money-framework.pdf

⁴⁰ NTEM version 7.2 which forecasts the growth in trips by place up to 2051 based on projections of population, employment, housing, car ownership and trip rates. <https://data.gov.uk/dataset/11bc7aaf-ddf6-4133-a91d-84e6f20a663e/national-trip-end-model-ntem>

⁴¹ In his November 2017 Budget speech the Chancellor said: "Last week the National Infrastructure Commission published their report on the Cambridge-Milton Keynes-Oxford corridor. Today we back their vision and commit to building up to 1 million homes by 2050. Completing the road and rail infrastructure to support them."

⁴² <https://www.gov.uk/government/publications/the-green-book-appraisal-and-evaluation-in-central-government>

⁴³ WebTAG <https://www.gov.uk/guidance/transport-analysis-guidance-webtag> Relevant WebTAG units include Rail Appraisal Unit A1.3 and Wider Economic Impacts Unit A2.1.

⁴⁴ The wider economic impacts which are quantified in this report are described as 'Level 2' impacts in WebTAG, Unit A2.1. <https://www.gov.uk/government/publications/webtag-tag-unit-a2-1-wider-economic-impacts-may-2018>

so are not reflected in transport markets⁴⁵. The wider economic impacts quantified in this report are those that can be estimated by assuming fixed land use (under an assumption that employment and population, in terms of totals and distribution, are the same with and without the scheme) as opposed to estimating the changes in the location of businesses and households as a result of EWR Phase 2 and the impacts these changes could have on costs and benefits.

- 3.4 Transport user benefits from EWR Phase 2 have been assessed using a transport model developed by LeighFisher for the DfT (additional information on the model is provided at Annex B). The wider economic impacts have been assessed using outputs from the transport model in line with WebTAG guidance on Level 2 wider impacts which are: agglomeration (static clustering); output change in imperfectly competitive markets and; labour supply impacts⁴⁶.
- 3.5 Phase 2 BCRs are calculated by comparing the costs and benefits associated with a do something forecast (with EWR) and a do minimum forecast (without EWR). The appraisal period is 60 years from opening (until 2084/85) and demand growth is capped in 2037 (20 years from the appraisal year) after which demand is grown in line with population projections in line with WebTAG guidance⁴⁷.

Growth scenarios

- 3.6 The range in BCR depends on assumptions made about economic and housing growth in the Oxford-Cambridge Arc. Three growth scenarios have been tested:
 - A **baseline** scenario using population forecasts derived from the National Trip End Model (NTEM version 7.2), (around 20,000 additional households in the Arc each year)⁴⁸,
 - An **intermediate growth** scenario that for each local authority uses the higher of NTEM household projections, the local assessment of housing need, based on publicly available documents, or the indicative MHCLG assessment of housing need, (around 24,000 additional households in the Arc each year)⁴⁹, and
 - A **high growth** scenario largely based on the NIC's transformational growth scenario, including specific locations and levels of housing where indicated in the supporting documentation accompanying the NIC's report (around 30,000 additional households in the Arc each year)⁵⁰.
- 3.7 Each growth scenario is applied in both the do minimum (without EWR) and in the do something (with EWR). So although Phase 2 has been modelled in high growth scenarios, the analysis in this report has assumed that additional growth is background growth that is not dependent on EWR.
- 3.8 Annex C sets out the household projections from NTEM, the local assessment of housing needs, and the indicative MHCLG assessment of housing need. These are

⁴⁵ Unit A2.1 page 7 <https://www.gov.uk/government/publications/webtag-tag-unit-a2-1-wider-economic-impacts-may-2018>

⁴⁶ Table 2, page 15 in Unit A2.1 outlines the Level 2 impacts. Units A2.2 to A2.4 provide methodologies for quantifying the impacts.

⁴⁷ Unit A5.3 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/715482/tag-unit-a5-3-rail-appraisal-may-2018.pdf

⁴⁸ Demand is forecast for a 20 year period until 2037-38 in accordance with DfT guidance, after which demand increases in line with the Office for National Statistics (ONS) forecast for national population growth.

⁴⁹ Figures for MHCLG indicative housing need assessments and local assessments of housing need are as of September 2017. Overall the MHCLG assessment of need is the highest of these three sets of numbers. However, for some places the local needs assessment or NTEM figures are higher. Where this is the case the highest of the three estimate is used, so that the 'intermediate growth' scenario is not lower than the 'baseline scenario' in these cases.

⁵⁰ NIC (2017) Partnering for Prosperity: a new deal for the Cambridge-Milton Keynes-Oxford Arc, page 26 <https://www.nic.org.uk/wp-content/uploads/Partnering-for-Prosperty.pdf>

used in the baseline and medium growth scenarios, as set out above. In the 'high growth' scenario the amount and distribution of new households is taken from Table 3.3 in a report by Steer Davies Gleave (SDG, now known as Steer) for the NIC⁵¹. One alternative assumption was made in the high growth scenario, this was to remove the new settlement which SDG had assumed at Calvert. Instead this development was spread out across the rest of the Arc. This is because the current HS2 and EWR plans do not include a station at Calvert, so it was thought to be more robust not to include a significant settlement there.

- 3.9 Whilst the higher growth scenario is, in broad terms, in line with stated ambition of government⁵² it is not intended to represent government policy on the scale of development at any particular location. Rather, the higher growth scenario represents a holding assumption prior to further central and local government decisions on where additional development could be located.

Appraisal results

- 3.10 Table 3-1 provide appraisal results for each of the three scenarios. In line with webTAG, costs and benefits are assessed over 60 years after the last service was introduced and discounted to 2010 values and prices⁵³.

	Baseline growth	Intermediate growth	Higher growth
Revenue	£661m	£738m	£903m
Capital cost (Capex)	-£813m	-£813m	-£813m
Operating costs (Opex)	-£245m	-£268m	-£280m
Whole life costs	-£317m	-£317m	-£317m
Cost to broad transport budget	-£713m	-£659m	-£507m
Value of time savings	£391m	£440m	£543m
User charge benefits	£168m	£187m	£229m
Congestion	£286m	£322m	£398m
Indirect taxation	-£132m	-£146m	-£180m
Other road effects	£63m	£71m	£88m
Rail carbon cost	-£20m	-£25m	-£27m
Transport user benefits	£757m	£848m	£1,050m
Initial BCR	1.1	1.3	2.1
Wider economic impacts	£152m	£163m	£170m
Adjusted BCR (including wider economic impacts)	1.3	1.5	2.4

Figure 3-1: Appraisal results (£ millions, present values, 2010 prices)

⁵¹ SDG (2017), Oxford, Milton Keynes, Cambridge and Northampton Growth Corridor: Transport Infrastructure Assessment: Final Report November 2017, <https://www.nic.org.uk/wp-content/uploads/First-Last-mile-Strategy-Assessment-Reports-Transport-Infrastructure-Assessment-First-Last-mile-Strategy-Assessment-Report-SDG-2017.pdf>

⁵² Government response to 'Partnering for Prosperity: a new deal for the Cambridge-Milton Keynes-Oxford Arc', page 3, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/752040/Government_response_to_Partnering_for_Prosperty_a_new_deal_for_the_Cambridge-Milton_Keynes_Oxford_Arc.pdf

⁵³ See paragraph 2.6.1 and Table 4 in Unit A5.3

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/715482/tag-unit-a5-3-rail-appraisal-may-2018.pdf

Train service specification

- 3.11 The economic appraisal is calculated from the costs and benefits associated with the difference between the do minimum (rail services provided without EWR) and the do something (with EWR rail services).
- 3.12 The do something includes planned train services running on EWR Phase 2 consisting of:
- 2 passenger services hourly between Oxford and Milton Keynes (introduced by the end of 2023)
 - 1 passenger service hourly between Oxford and Bedford (introduced by the end of 2023)
 - 1 passenger service hourly between Aylesbury and Milton Keynes (introduced from the end of 2024)
- 3.13 The do minimum, against which the EWR Phase 2 scheme and associated train service assumptions have been tested, assumes known committed schemes and train service changes on other parts of the rail network, including:
- HS2 Phase One
 - Crossrail
 - Thameslink, Southern and Great Northern franchise December 2017 timetable
 - East Midland Trains timetable
 - Post HS2 West Coast Mainline timetable

Passenger growth

- 3.14 Background rail demand growth to and from towns and cities connected by EWR Phase 2 (including Oxford and Milton Keynes) has been 3.6% per year over the last 10 years, slightly higher than the national average of 3.4%⁵⁴. By comparison forecast demand growth for EWR Phase 2 is relatively conservative, 2.1% in the base scenario and 3.4% in the high growth scenario (over the next 20 years).

Oxford to Cambridge Expressway

- 3.15 A proposed 'Oxford to Cambridge Expressway' is being developed by Highways England under the Roads Investment Strategy. The new road is expected to improve connectivity between Oxford, Milton Keynes and Cambridge, to divert through-traffic away from Oxford's ring road and mitigate congestion on the A34⁵⁵. An east-west Expressway is intended to complement EWR in supporting growth across the corridor.

Capital Costs

- 3.16 The capital cost of the scheme has been estimated by Network Rail who are promoting Phase 2. The cost used in this economic assessment is from Network

⁵⁴ Compound annual growth rate, LeighFisher analysis of MOIRA data, 2007-2017. This compares to a national average of 3.4% from ORR Statistics (2007/08 to 2017/18) <http://dataportal.orr.gov.uk/displayreport/report/html/a10e3c7b-7766-40ae-a87a-14c56cf85a63>

⁵⁵ Oxford to Cambridge Expressway Stage 3 Report from November 2016

Rail's Guide to Rail Investment Projects (GRIP) stages 3 Refresh stage⁵⁶. In addition, HS2 integrated civils costs have been included which are currently an estimate from HS2 Ltd. These have been estimated to be £1m in 2018/19 and a further £17.8m between 2019/20 to 2023/24.

- 3.17 In line with HMT Green Book capital costs already incurred are treated as “sunk” hence excluded from the economic appraisal.
- 3.18 Optimism bias of 18% has been applied to the point cost estimate in addition to a P-mean (Quantitative Risk Assessment at the mean estimate) risk⁵⁷. This provides a total contingency of 51% (compared to the point cost estimate). All costs are inflated to account for construction cost inflation (using the OBR RPI index) for input into the appraisal model.
- 3.19 For the economic appraisal (in line with WebTAG) annual capital costs are converted in to market prices using the indirect tax factor (19%). This is then converted to 2010 prices using the GDP deflator. The net present values are then calculated for each year in the appraisal period.

Whole Life Costs

- 3.20 Network Rail estimated Whole Life Costs (WLCs) as part of their 2015 GRIP 2 estimation and it is this estimate, expressed as a proportion of total lifetime cost, which is currently used in the appraisal. This includes maintenance/Network Rail operations and renewals of the infrastructure over time. GRIP 3 lifecycle cost work focused on optioneering for a limited number of assets, and did not provide a suitable estimate which covered the entire route. The GRIP 2 WLC estimate has been adjusted to be in line with the overall change in capital costs which occurred between GRIP 2 and GRIP 3.

Operating Cost

- 3.21 LeighFisher has produced an operating cost model to calculate incremental costs attributed to operations, maintenance and renewals as a result of operating the do something train service specification. Operations include rolling stock lease costs, energy costs, rolling stock maintenance, variable and capacity track charges, staff costs and station operating costs. Rolling stock operating costs are based on estimates for Class 170 2 car vehicles, although in the intermediate and higher growth scenarios this increases to 3 cars when demand on 2 car vehicles exceeds capacity. The baseline growth scenario has also been tested using all 3 car and all 4 car operations and this does not change the value for money category based on the resulting adjusted BCR.

Environmental benefits and disbenefits

- 3.22 The modelling of transport-related environmental impacts such as noise, air quality and greenhouse gas emissions have been monetised and included in the BCRs in

⁵⁶ GRIP refers to Network Rail's Guide to Rail Investment Projects. The cost used in the appraisal is consistent with Network Rail's current anticipated final cost as submitted as part of its Transport Works Act application (statement of cost) <https://www.networkrail.co.uk/our-railway-upgrade-plan/key-projects/east-west-rail/western-section/>

⁵⁷ In line with WebTAG UnitA5.3 Table 3, page 7 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/715482/tag-unit-a5-3-rail-appraisal-may-2018.pdf

this report using standard DfT methodology⁵⁸. Network Rail have also undertaken and published an Environmental Statement detailing land use and environmental impacts from the construction and operation of the scheme and how, where possible these will be mitigated⁵⁹, these impacts are not monetised and so are not included in the BCRs in this report.

Other wider impacts

3.23 It is likely that EWR will bring other wider impacts to the Arc. These are harder to quantify, some involve estimating changes in land use as a result of EWR, and the methodologies to estimate these other wider impacts are not as well developed as those in standard transport appraisal. Such impacts, not quantified in this report, include⁶⁰:

- Enabled development: housing development which is enabled as a result of the scheme can generate benefits in the housing market over and above the transport market benefits in a standard transport appraisal. Whilst the transport user benefits (and some wider economic impacts) of EWR Phase 2 have been assessed in a 'high growth' scenario of higher economic and population growth, which implies additional homes, this modelling assumes that this additional growth is not dependent on EWR, and that EWR does not result in further growth on top. This no dependent growth assumption is made in the interests of simplicity and transparency. It means that the benefits of the scheme even under higher growth are limited to the transport market, and the fixed land use agglomeration effects described above. To the extent that the scheme does in practice induce additional development growth, there would be impacts in property markets as well as the transport market. The methodologies to estimate impacts in these markets are not as well developed as those in the transport market.
- The wider effects of business relocation: where businesses relocate to take advantage of the opportunities created by transport improvements, becoming closer together, forming clusters around better connected places (such as rail stations). This clustering can provide additional connectivity and journey time benefits, and thereby further agglomeration impacts and productivity gains of the type described above. Agglomerations gains in one location, however, may be offset by disagglomeration effects elsewhere in the UK.
- Additional labour market effects: including impacts via (1) relocation of labour to areas with different productivity levels, which could lead to net gains or losses depending on circumstances and the assumptions made about the effects on the labour that relocates; and (2) changes to labour supply by making work in the Arc more attractive and rewarding.
- Foreign investment and international labour: By facilitating economic growth in the Arc EWR, and other interventions, could attract jobs and investment from overseas as well as the rest of the UK.

⁵⁸ See WebTAG rail UnitA5.3 Section 3.3

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/715482/tag-unit-a5-3-rail-appraisal-may-2018.pdf Road decongestion benefits due to modal shift from road, based on assumption that 33% of new rail miles have shifted from road. This is a flow weighted average of the WebTAG diversion factors. Other marginal external impacts of modal shift from road include infrastructure, accident, air quality, noise, and greenhouse gases

⁵⁹ Available on the Network Rail website, Transport Work Act application documents <https://www.networkrail.co.uk/our-railway-upgrade-plan/key-projects/east-west-rail/western-section/>

⁶⁰ Many of these additional wider economic impacts are described in WebTAG Unit A2.1. Those that involve land use change are described as 'Level 3' impacts <https://www.gov.uk/government/publications/webtag-tag-unit-a2-1-wider-economic-impacts-may-2018>

- Supply chain: productivity gains to industries in one location or sector can impact on other sectors and locations via supply chains. This means that productivity gains within the Arc can, in a sense, be exported to other industries and locations across the country generating efficiencies and output gains in the supply chain.
- Freight benefits: EWR is being built to accommodate rail freight. Phase 2 and the complete EWR programme is likely to provide cost savings for moving freight by rail, which has the potential to deliver additional direct benefits, via lower costs to freight users, and indirect benefits by removing some freight traffic from the roads.

3.24 DfT and EWR Co will continue to consider the wider range of benefits and impacts of EWR and will continue to work across government on how EWR will help support and enable central and local government plans for growth in the Arc.

3.25 In addition to its longer term connectivity and other benefits (set out above), the construction of EWR Phase 2 itself has the potential to support jobs in the region and beyond. The East West Rail Alliance (procured by Network Rail to build EWR Phase 2) have estimated they will directly support up to 900 on-site construction jobs in 2021. Additional jobs are also being supported in planning and designing the railway and will be supported in delivering rail and signalling systems, rolling stock construction and operating the railway. The Alliance is also undertaking a range of activities to support the development of skills and job opportunities in local communities and in promoting science, technology, engineering and mathematics (STEM) projects in schools and colleges. The Alliance has an objective to recruit local people for local jobs, provide apprentice opportunities (which is already happening) and provide training and employment opportunities to workless local residents in the local authorities along the route of EWR in order to help grow their skills and improve their long term employability.

Annex A: Local policy in support of EWR Phase 2

This table is taken from Network Rail’s Statement of Case for EWR Phase 2 Transport and Works Act Order application⁶¹.

Document	Policy
Buckingham Thames Valley Strategic Economic Plan Refresh (2016-2031)	This plan forecasts Buckinghamshire’s population will grow by 14.8% between 2013-2033 ranking the LEP area as the 12th fastest growing in the country and workplace-based employment will grow by an average annual rate of 1.1% a year. The plan recognises the importance of East West Rail and that it is ‘delivered without unnecessary delay’.
Cherwell Local Plan 2011 – 2031 Part 1: adopted 2016	Policy SLE4: supports key transport proposals, including projects associated with East West Rail. Appendix 8 contains the Infrastructure Delivery Plan and identifies East West Rail Phase 2 as a necessary project to ‘support economic growth and new homes with better access to the national rail network’ ⁶² .
Connecting Oxfordshire: Local Transport Plan 2015-2031	The LTP sets out strategic rail priorities, including support to the EWR consortium and Network Rail in the design and delivery of EWR PHASE 2. The LTP highlights that the scheme will improve connectivity between Oxfordshire and the east, in particular high-value growth areas around Milton Keynes and Cambridge and will improve opportunities for jobs and economic growth in the county.
Aylesbury Vale District Local Plan 2004 (Saved Policies)	Policy GP25 (Re-opening of rail routes) that states development will be resisted if it prejudices the use of the rail route running through the district between Bicester and Bletchley, as well as the northward link from Aylesbury.
Vale of Aylesbury Local Plan: Submission Draft	Policy S6 (Protected Transport Schemes) highlights EWR as a strategically important infrastructure scheme that directly impacts on the district; which identifies EWR as a Protected Transport Scheme. Development will not be granted if it would prejudice the implementation of EWR, including new stations.
Buckinghamshire County Council Local Transport Plan 4 - 2016	<p>The LTP highlights the economic benefits that EWR PHASE 2 will deliver. It states that the scheme will help to stimulate sustainable economic growth not only in Buckinghamshire but also in Oxfordshire and Bedfordshire. It highlights that the delivery of EWR PHASE 2 will support the England’s Heartland alliance and the Buckinghamshire Thames Valley Local Economic Partnership’s Strategic Economic Plan. It also states that the scheme could boost the regional economy by £72.7 million a year with a £33.2 million boost to UK tax receipts (based on the findings of an assessment of the economic impact of the Western Section undertaken by Arup).</p> <p>Policies 4 and 5 state that BCC will work in partnership with key stakeholders to develop a reliable rail transport network that: provides effective access within the county; links us to the rest of the country; and is integrated with other modes of transport, including airports.</p> <p>BCC will work to ensure that HS2 is built with minimal disruption to residents and that it brings benefits to Buckinghamshire: including a new East West Rail station in the north of the county and high-quality restoration of construction sites.</p>

⁶¹ <https://www.networkrail.co.uk/our-railway-upgrade-plan/key-projects/east-west-rail/western-section/>

⁶² Item 3 of the Appendix 8:Infrastructure Delivery Plan of the Cherwell Local Plan 2011-2031 (adopted July 2015)

Document	Policy
	The LTP states that BCC will continue to work as an active member of the East West Rail Consortium, supporting the earliest possible delivery of East West Rail services. East West Rail will support economic growth, new housing and jobs. It connects Aylesbury to Milton Keynes, provides a new station at Winslow, and improves service capacity between Aylesbury and Princes Risborough.
Milton Keynes Core Strategy 2013	Policy CS11 (A Well-Connected Milton Keynes) seeks to implement a number of measures to improve public transportation to meet the demand of the borough; including 'to engage with Network Rail and relevant stakeholders along the EWR line to identify operational benefits which thereby provide additional support for a more sustainable transport strategy and/or economic growth of the city'.
Plan: MK Submission Version	Policy CT4 (Public Transport) seeks to develop the quality and capacity in public transport through a number of measures, including supporting the development of EWR PHASE 2.
A Transport Vision and Strategy for Milton Keynes: Local Transport Plan 3 (2011 to 2031)	The LTP emphasises that EWR PHASE 2 will: "support economic growth and investment in new jobs and homes; provide for faster journeys between towns and cities to the north and west of London, avoiding the need to travel via the capital; provide an alternative to travel by road, reducing congestion and carbon emissions; and create increased capacity elsewhere on the rail network in the longer term". The LTP also highlights that EWR PHASE 2 will link the knowledge economies of Cambridge and Oxford with Milton Keynes providing additional economic benefits. It also expresses support for the direct connectivity to Reading, Oxford and Bedford that will be achieved through the scheme.
Local Transport Plan 3: The Central Bedfordshire Council Transport Strategy	The LTP highlights the intention of Central Bedfordshire Council to continue to support the EWR Consortium in delivering EWR PHASE 2.
Bedford Local Plan 2035	Policy 94S (Transport Infrastructure and Network Improvements) states that the Council will work with its partners, agencies and developers to deliver reduced congestion around the town centre and key strategic routes while promoting sustainable transport modes, through the consideration and the early provision of a number of strategic improvements, including the East West Rail Scheme.
Bedford Local Transport Plan 2011-2021	The LTP highlights that the development of EWR PHASE 2 will deliver improvements to rail infrastructure within the Borough. A key strategy is to "support the work of the EWR Consortium for the reinstatement of rail services between Oxford / Milton Keynes / Bedford / Cambridge".

Annex B: Further detail on demand modelling

Modelling rail passenger demand

DfT and EWR Co commissioned LeighFisher⁶³ consultants to assess the potential passenger demand and transport benefits from rail services enabled by EWR Phase 2.

LeighFisher developed a forecasting framework to undertake the economic appraisal and to produce the BCRs included in this report. A diagram of the model suite created is given below.

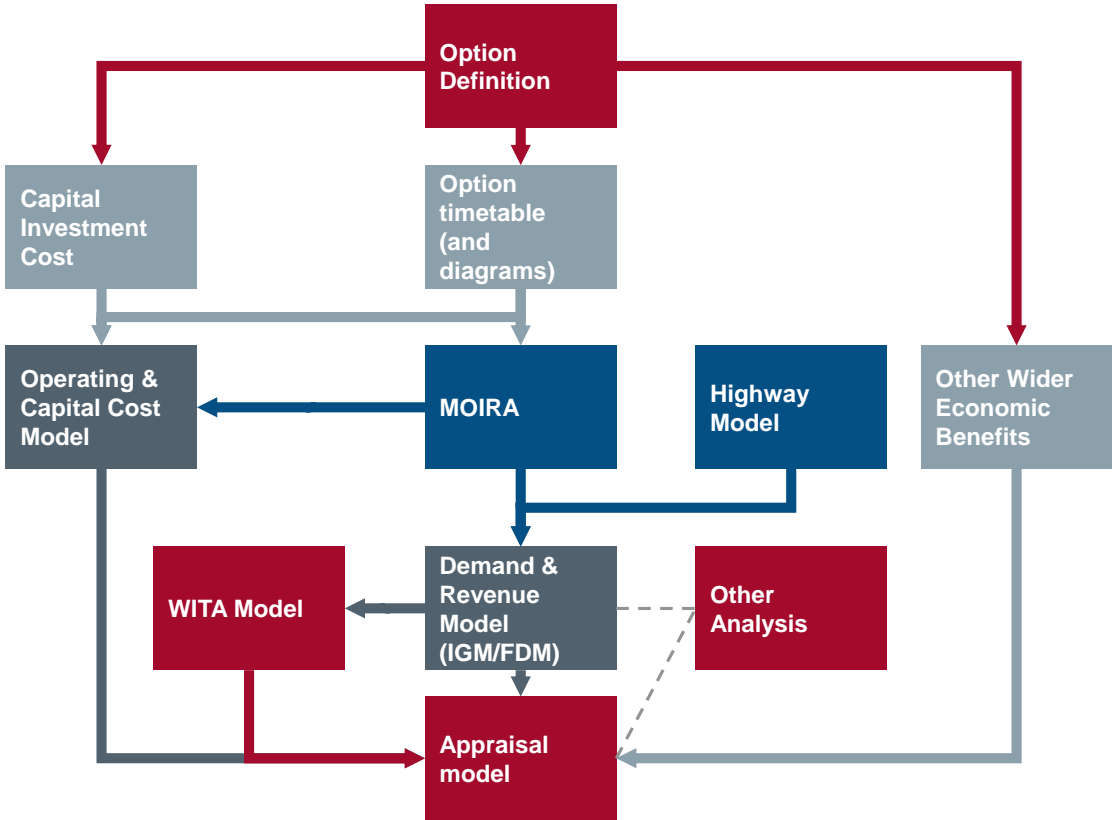


Figure B1 - EWR modelling framework

Source: LeighFisher

⁶³ <http://www.leighfisher.com/>

The model is primarily a rail-only model and forecasts demand between stations only. Generalised journey times are produced using the rail industry MOIRA software which takes into account journey time, frequency and interchange penalties. Within this model suite, a gravity model specific to the scheme is used to forecast demand where changes in generalised journey time (GJT)⁶⁴ are significant (where they fall by 20% or more). This threshold is noted in PDFH as a threshold at which reliance on GJT elasticities may become inappropriate. In these cases, a standard GJT elasticity approach⁶⁵ would tend to underestimate demand. For example, the number of rail passengers between Oxford to Milton Keynes is currently very low, since there is no direct link and current GJT is high. Modelling the impact of EWR based on incrementally growing these low levels of rail passengers is not likely to produce a good estimate of demand.

The gravity model forecasts demand in the do something scenario (with EWR Phase 2) are modelled with reference to the attraction between origin-destination pairs based on factors including population, employment and GJT.

The gravity model was calibrated using data for 17,000 station to station flows across full, reduced and season ticket type categories for the 2016 rail year. Regression analysis was performed on the combinations of predictor variables, including population, employment and GJT.

The aim of the gravity model is to estimate what level of rail demand can reasonably be expected between places (Oxford to Milton Keynes for example) based on observations of what flows exist between places of similar gravity, or attraction, in terms of population, employment and other factors.

The gravity model elasticities are set out in Figure B2. The model is split into ten segments, with six sets of parameters for forecasting non-seasons demand and four for seasons demand⁶⁶. The segments are based on flows either inside or outside the South East and above or below GJT thresholds set out in Figure B3 (once GJTs have been updated to reflect EWR central section services).

Figure B3 further defines the segments included in the gravity model and in Figure B2. The 'GJT criteria' in Figure B3 provides the 'GJT Threshold' referred to in Figure B2.

⁶⁴ Generalised Journey Time (GJT) is a measure incorporating the total station-to-station journey time plus time penalties based on the frequency of service and the number of interchanges required. It is expressed in minutes of journey time.

⁶⁵ Paragraph 2.3.1 page 2 WebTAG Unit A5.3

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/715482/tag-unit-a5-3-rail-appraisal-may-2018.pdf

⁶⁶ Season tickets is all weekly or longer products such as weekly seasons, monthly seasons and annual seasons. Non-season includes all full and reduced tickets.

Region	Non-Seasons			Seasons							
	SE-SE	SE-SE	Non-SE	SE-SE	Non-SE	Non-SE	SE-SE	SE-SE	Non-SE	Non-SE	
GJT Threshold	Low	High	High	Med	Med	Low	Low	High	High	Low	
GJT	-2.07	-1.91	-2.35	-2.48	-1.35	-1.75	-2.04	-2.88	-1.74	-2.72	
Average Fare/Mile	-0.70	-1.47	-1.51	-1.12	-0.87	-1.03	-0.71	-1.28	-1.34	-1.19	
Distance	0.00	0.00	0.00	0.00	-0.36	0.00	0.00	0.00	0.00	0.00	
Origin	Car Ownership	-2.42	0.04	0.00	0.00	-1.47	0.04	0.00	1.98	0.00	0.00
	Population	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.27	0.22
	Employment	0.37	0.51	0.50	0.57	0.37	0.54	0.40	0.31	0.00	0.00
	GVA Per Capita	0.00	0.28	0.00	0.00	0.00	0.44	0.00	0.09	0.00	0.00
	Occupation: Class 1-4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Destination	Car Ownership	0.00	0.00	0.00	0.00	-1.60	0.00	0.00	-0.80	0.00	0.00
	Population	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Employment	0.69	0.74	0.68	0.69	0.41	0.58	0.48	0.40	0.33	0.41
	GVA Per Capita	0.49	1.13	0.00	0.00	0.00	0.52	0.00	1.16	0.00	0.00

Figure B2: Gravity model elasticities for estimating demand for EWR

Ticket Type	PDFH Segment	Distance Criteria	Demand Criteria	GJT Criteria
Non-Seasons	South East	>10	>5,000	<60 (low)
Non-Seasons	Non-South East	>20	>2,500	<80 (low)
Non-Seasons	South East	>10	>2,500	60-100 (med)
Non-Seasons	Non-South East	>20	>2,500	80-120 (med)
Non-Seasons	South East	>10	>1,000	>100 (high)
Non-Seasons	Non-South East	>20	>1,000	>120 (high)
Seasons	South East	>10	>2,500	<60 (low)
Seasons	Non-South East	>20	>2,500	<60 (low)
Seasons	South East	>10	>1,000	>60 (high)
Seasons	Non-South East	>20	>1,000	>60 (high)

Figure B3: Further definition of segments in the gravity model

From the demand forecast for the do minimum and do-something scenarios, transport user benefits are estimated. Due to the large change in GJT reliance on the rule of half (i.e. assumption of linear demand curve) is inappropriate and therefore numerical integration has been used to assess the transport user benefits. The incremental demand generated also drives a gain in net national rail revenue which is netted from the costs in the BCR calculation.

In addition to GJT benefits EWR would also provide a fare saving to passengers, since it would provide a more direct route with lower mileage which is assumed to lead to a lower fare. This appears in the appraisal results as a “user charge” saving.

Some passengers making trips already between origins and destinations served by EWR would therefore see a fare reduction – this revenue loss is included in the overall revenue figure.

The modelling does not take into account any benefits from reduced crowding.

Growth in rail passenger demand

A growth indexation model has been developed, to account for exogenous growth during the course of the appraisal period. The standard Passenger Demand Forecasting Handbook (PDFH) methodology, given in PDFH v5.1 Chapter B1 is used. Elasticities are from PDFH v5.1, except for: car operating costs (sourced from PDFH v5.0) and; fares elasticities (sourced from PDFH v4.0). This is in line with the extant WebTAG guidance in unit M4, table 1⁶⁷ at the time the model was developed.

Demand Driver Generator (DDG) growth forecasts from December 2017 were used to produce an index for the various drivers considered including forecasts of population and employment by MSOA as well as forecasts of GDP per capita, car ownership and the cost of travel via other modes. The values in the DDG forecasts for each of the drivers are converted into a cumulative index for each zone. A weighted average index is then calculated with the location of station demand across the UK and weighting being by demand across flows that benefit from EWR Western Section.

For intermediate and higher growth scenarios two further sets of demand growth inputs were produced by Network Rail and provided to LeighFisher for implementation in their modelling suite. These alternative population and employment forecasts were created based on the assumption discussed in section 3.6. Starting from a consistent baseline growth forecast, increases in population are modelled in line with assumptions on additional dwellings outlined at paragraph 3.6. Employment is assumed to increase in line with increases in population.

Forecast demand growth for EWR Phase 2 is 2.1% in the base scenario and 3.4% in the high growth scenario (over the next 20 years).

⁶⁷ https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/712788/tag-unit-m4-forecasting-and-uncertainty-may-2018.pdf

Annex C: Projections of dwellings

Geography	MHCLG Dwelling Stock in 2011	Short Run Historic Delivery Rates	Long Run Historic Delivery Rates	National Trip End Model version 7.2 - Household projections	MHCLG data on local assessment of housing need, based on publically available data sources (as of September 2017)	MHCLG Indicative assessment of housing need based on proposed formula (as of September 2017)
	2011	Average dwellings p.a. 2011-2016	Average dwellings p.a. 2001-2016	Avg. p.a. 2017 to 2039	Average dwellings p.a., 2017 to 2026	Average dwellings p.a., 2017 to 2026
Oxford	57,150	250	400	500	1,400	750
Cherwell	59,050	850	600	1,350	1,150	750
Aylesbury Vale	72,300	1,150	900	1,500	950	1,500
Milton Keynes	102,350	1,300	1,650	1,950	1,750	1,850
Central Bedfordshire	108,700	1,450	1,400	1,500	1,600	2,550
Bedford	67,500	950	800	1,200	950	1,300
Total EWR Phase 2 LAs	467,000	5,900	5,750	8,000	7,800	8,650
Total NIC Arc	1,346,200	14,500	14,850	19,800	20,050	21,050
East Midlands	1,694,350	12,550	14,900	14,100	14,750	16,350
East of England	2,530,900	20,050	23,100	31,250	30,400	34,700
London	3,363,350	28,300	29,500	38,850	40,400	72,400
South East	3,692,800	28,750	31,650	39,400	44,550	47,950
England	22,983,350	167,900	185,400	208,200	231,900	265,950

Notes:

- All columns refer to dwellings data, with the exception of NTEM as these represent household projections used as a proxy for the number of dwellings
- Figures rounded to the nearest 50 dwellings
- Dwellings data based on publically available data sources including MHCLG Table 125: dwelling stock estimates by local authority district: 2001 to 2016, MHCLG Table 122: housing supply; net additional dwellings, by local authority district, England 2001-02 to 2017-18; Housing Needs Assessment and Local Plans from MHCLG Dataset published on Sept. 2017; DfT's National Trip End Model version 7.2 Household growth projections

Glossary

Commonly Used acronym	Main term	Description
	Oxford-Cambridge Arc (the Arc) and Cambridge-Milton Keynes-Oxford Corridor (the corridor)	Local authorities covering the counties of Northamptonshire, Cambridgeshire, Hertfordshire, Buckinghamshire and Oxfordshire and the unitary authorities of Bedford, Central Bedfordshire, Luton, Swindon and Milton Keynes.
EWR	East West Rail	Strategic railway connecting East Anglia with Central, Southern and Western England.
EWR Phase 2	East West Rail Western Section Phase 2	Railway to run between Oxford and Milton Keynes, between Oxford and Bedford and between Milton Keynes and Aylesbury.
EWR Co	East West Rail Company	Company set up by the Transport Secretary to oversee the East West Rail project.
DfT	Department for Transport	Government department responsible for UK transport.
	Network Rail	Railway company owning and operating most of Great Britain's railway infrastructure.
	Oxford to Cambridge Expressway	New road expected to improve connectivity between Oxford, Milton Keynes and Cambridge.
	Highways England	Government company charged with operating, maintaining and improving England's motorways and major A roads.
RIS	Roads Investment Strategy	Collection of documents by the DfT and Highways Agency setting approach to improve England's motorways and major roads.
	East West Rail Consortium	Group of local authorities and businesses working closely with Government, East West Rail Company and Network Rail.
BCR	Benefit Cost Ratio	Ratio of benefits to costs indicating how much benefit is obtained for each unit of cost.
NTEM	National Trip End Model	Forecasts the growth in trip origin-destinations (or productions-attractions) up to 2051 for use in transport modelling.
WebTAG	Web based Transport Appraisal Guidance	DfT's online suite providing information on the role of transport modelling and appraisal.
NIC	National Infrastructure Commission	Commission providing the government with advice on major long-term infrastructure challenges.
	East West Rail Alliance	Responsible for designing and building the Western Section.

Commonly Used acronym	Main term	Description
	Transport Investment Strategy	Sets out the DfT's priorities and approach for future transport investment decisions.
	Industrial Strategy White Paper	Sets out a long-term plan to boost the productivity and earning power of people throughout the UK.
	NIC Partnering for Prosperity	Report containing recommendations for securing the Arc's long-term economic success.
GVA	Gross Value Added	Measure of the value of goods and services produced in an economy.
	National Rail	Rail Delivery Group's brand to promote passenger railway services.
	Economic growth	Long-term expansion of the economy's productive potential.
LEPs	Local Enterprise Partnerships	Private sector led partnerships between businesses and local public sector bodies.
EEHSA	England's Economic Heartlands Strategic Authority	Authority working with the government and partners to deliver East West Rail and the Oxford-Cambridge expressway.
	HM Treasury Green Book	Guidance on how to appraise and evaluate policies, projects and programmes.
MHCLG	Ministry of Housing, Communities and Local Government	Government department responsible for housing, community and local government matters in the UK.
	Capital costs	Costs of acquiring and maintaining an asset.
	Whole life costs	Total costs of ownership over the life of an asset.
	Operating costs	Ongoing costs of running a business or system.