

## **National Infrastructure Commission call for evidence on the Cambridge-Milton Keynes-Oxford ‘Growth Corridor’**

### **Response from Oxfordshire County Council and the Oxfordshire Local Enterprise Partnership**

#### Introduction

*This response supports the overall main submission from the six Local Enterprise Partnerships along the corridor. Oxfordshire County Council and the Oxfordshire Local Enterprise Partnership fully endorse this overall submission, which this document is designed to complement. Its aim is to provide more detail on the importance of this corridor for Oxfordshire, and to demonstrate how proposed strategic investment in rail and road will maximise the benefit of this national investment by creating and supporting local growth and infrastructure.*

***Many places across the Cambridge – Milton Keynes – Oxford corridor have very successful local economies and are perceived as highly desirable places to live.***

*What have been the key drivers for success?*

1. Oxfordshire is renowned across the globe for its academic excellence, innovative business culture and the quality of its built and natural environment. The county is home to Europe’s largest concentration of major science research facilities, underpinning our leading position in advanced engineering, manufacturing and life sciences, as well as sitting at the heart of the UK’s growing international space cluster.
2. Oxfordshire makes a disproportionately large contribution to UK economic performance in relation to its size and population. It is home to nearly 30,000 businesses, providing over 380,000 jobs, including a high proportion in research, science and technology, engineering, and high-tech manufacturing. The county’s economy is recognised as one of the best performing in the UK and its contribution to the national economy is well above average. In 2014 Oxfordshire contributed £20.5 billion to the UK economy. Workplace Gross Value Added per head in Oxfordshire in 2014 was £30,485 (up 4.8% from 2013) compared to the UK average of £24,958.
3. Oxford’s unique character as a leading university city and historic centre sets it apart from the rest of the county, attracting significantly more visitors than most towns or cities of comparable size. Tourism, business and academia are vital to the economy and 35% of the county’s jobs are in the city. Due to the high number of jobs and the shortage and cost of housing in the city, more people commute to Oxford from outside the city than there are working residents.
4. The city also provides the majority of the county’s hospital services, with three major teaching hospitals. Oxford’s global academic reputation and its strategic position at one apex of the UK’s ‘Golden Triangle’ with Cambridge and London, provides huge potential for inward investment and for businesses to spin out and grow in high quality business locations across the region.

5. Oxford is therefore by far the most important 'centre of gravity' in the county, although Bicester and the Science Vale (Didcot/Wantage/Harwell) are growing in economic importance and, linked together, comprise the area defined as *Oxfordshire's Knowledge Spine* (see Appendix 1). This Spine connects leading edge research and development at Harwell and Culham in the south, to the life Science Bio Escalator in Oxford, on to the advanced engineering hub at Begbroke, and through to the growing Garden Town of Bicester in the north.
6. The creation of high value science-related jobs along the Spine represents a cornerstone of the economic growth strategy that is the basis of the county's Strategic Economic Plan and has underpinned our City Deal and Growth Deals.
7. Oxfordshire continues to plan for strong economic growth. It is already recognised nationally for its universities and the strength of its science-based knowledge industries, with many high-technology firms that now form an Oxfordshire technology cluster with outstanding strengths in four overlapping industries. It also provides a high-performing home for start-up businesses and innovation. The ambition of the Oxfordshire LEP is for it to be a global leader in 'Big Science'.
8. The growth of these sectors has been supported by a unique grouping of research facilities in Oxfordshire, including:
  - UK Atomic Energy Authority Culham Centre for Fusion Energy;
  - Science and Technology Facilities Council; Rutherford Appleton Laboratory;
  - Diamond Light Source, the national synchrotron facility;
  - Medical Research Council's facilities at Harwell;
  - Begbroke Science Park; and
  - Satellite Applications Catapult Centre.
9. Meanwhile, the county's population is rising - reaching 666,000 in 2013, having grown over 10% in the past decade. Economic and population growth is due to continue: the Oxfordshire Strategic Housing Market Assessment has identified the need for 100,000 new homes and 85,000 new jobs in Oxfordshire up to 2031. This ambition is further supported in Oxfordshire's Strategic Economic Plan (SEP).
10. Despite this the county retains a strong rural feel, including three Areas of Outstanding Natural Beauty and two National Trails. This combination of dynamic economy and access to high quality environment has been a key to Oxfordshire's success in recent years. Oxfordshire's rural areas are generally prosperous so have helped to retain economic vitality of the County's towns as thriving local service centres.

*What is holding back further growth and greater productivity?*

11. While the fundamentals of Oxfordshire's economy are strong, the major factors holding back growth and productivity include the extremely high cost of housing within Oxford and central Oxfordshire, a mismatch between the skills of some local people and those demanded by growth industries, and barriers to travel and communication across and beyond the county.
12. The supply of housing to Oxford's housing market area is severely limited. This, combined with high demand driven by a strong local economy and high quality of life, is resulting in severe housing pressure and high average house prices. This is already acting as a brake on the economy - and certainly will in the future both on the sustainability of our business and university research sector to attract staff at all levels and on the quality of life of local residents, especially their ability to live close to where they work.

13. Oxfordshire has one of the most innovative and highly-skilled populations in England. However, a small but important proportion of its population is unable to fully participate in the labour market because they lack the skills and opportunities to do so. Young people need to be given appropriate skills training and opportunities in areas of skills shortages, skills providers must meet employer demand for worker training in current and future growth sectors, and employers must become more engaged with the county's skills agenda.
13. Above all, though, the lack of long term investment and planning in transport and communications infrastructure presents the most immediate challenge. Our future growth plans are threatened by the side effects of our current and past success. Existing patterns of development and high income levels have created an environment defined by high car ownership and high levels of car use – particularly outside of Oxford where Oxfordshire's dispersed pattern of population and employment centres has resulted in complex movement patterns and a highly congested road network.
14. The A34 in particular already experiences high levels of traffic congestion and delay. The A34 functions both as an important part of the national Trunk Road network, connecting the South Coast Ports with the Midlands and North, but also an essential local road providing the only high standard connection between Didcot, Oxford and Bicester and functioning as part of Oxford's ring road. Carrying over 70,000 vehicles per day, it is highly susceptible to minor incidents and disruptions which often result in major congestion events, most notably along the western boundary of Oxford, and between Oxford and Didcot.
15. Future growth in jobs, population and car ownership will have a significant impact on the highway network's ability to cope with traffic growth. Congestion on strategic and supporting road networks also creates challenging operating conditions for local bus services, which only benefit from bus priority on the approach to or within Oxford. As a result, journey times from main towns to Oxford can be slow, taking up to an hour at times to travel fewer than ten miles.
16. If Oxfordshire's growth plans are to be achieved, the county needs an effective mobility system that provides a real alternative to the private car and helps to reduce traffic congestion. This is a key aim of both our *Science Transit* vision, and our new Local Transport Plan.
17. Across the Oxford-Cambridge corridor there are many synergies between the institutions and companies which could open the way to better co-operation which would be both to their benefit and the benefit of the corridor and the nation as a whole. However the problems of poor connectivity make such co-operation difficult – indeed they make it easier for the institutions to compete rather than co-operate.
18. Oxfordshire occupies a strategic location on the busy road and rail corridor between the south coast ports, the Midlands and the north and enjoys easy links to London and the West Midlands via the M40 and upgraded rail links. However, it suffers a lack of connectivity to and from the east, in particular to the high-value growth areas around Milton Keynes and Cambridge. There are currently no direct rail connections to these centres, while travel by road involves cross-country single-carriageway routes or the use of the M25 around London. Improving the connectivity on this corridor – through East-West Rail and the Oxford to Cambridge Expressway projects - will place Oxfordshire at the centre of the south-east orbital corridor, as a key hub for south-west to north-east transport. With vastly improved road and rail links to these high-value centres of the UK economy, Oxfordshire will have improved agglomeration opportunities for jobs, growth and innovation.

*What planned or new infrastructure would best support sustainable growth and promote innovation over the long term?*

19. Movement along the Oxford to Cambridge route is likely to be made up of a number of overlapping shorter movements highlighting the importance of providing flexible strategic connectivity to link centres where there are significant amounts of growth already planned and where future growth can be more easily accommodated if there is the level of (particularly public transport) infrastructure and services that support it.
20. The current infrastructure allows barely adequate connections between the main development hotspots of England's Economic Heartland. However these connections do not meet our future strategic needs and are primarily for road based travel. For public transport there is often no alternative but to travel via London or the Midlands.

Road Solutions south of M40

21. The congestion problems on A34 demand that significant investment is made. As well as impacting on the ability to move along the Oxford-Cambridge axis, this route also has major implications for national movements from the south coast ports to the Midlands, Northern England and Scotland.
22. Highways England are currently investigating options for this; a Baseline Statement prepared by OCC saw only limited, supporting value in traffic management type measures with little alternative to major capacity increases. This could be via on-line widening of the road or by constructing a new route away from the current corridor, or a mixture of the two approaches.

Road solutions M40-M1

23. The road network between Oxford and Cambridge is already mostly dual carriageway standard but there are some sections where the only connections are single carriageway, including between Milton Keynes and M40.
24. There are a number of options for a strategic highway upgrade:
  - (i) A northern route could use the A4421 and A421 between the M40 and M1. This would provide connectivity to/around Bicester, where significant development is planned and upgrades to the perimeter road are required. This could connect to the A421 dual carriageway Tingewick Bypass, the single carriageway Buckingham Bypass and the rural single carriageway A421 to Milton Keynes.
  - (ii) A southern route could use the A418 and A4146 between the M40 and M1. The A418 through Aylesbury as an urban single carriageway road which, although it is recently constructed, is subject to congestion. East of Aylesbury is rural single carriageway, meeting the A4146, a modern standard road which connects to the A421 south of Milton Keynes.
  - (iii) A central route would involve constructing a new road through the Aylesbury Vale. While the overall population is relatively low the area does have a large number of extended villages. Depending on the route this would require the construction of about 35-40 km of new road.
25. Currently the journey from Central Oxford to Central Milton Keynes via the northern route would take about 65 minutes in off peak conditions; the journey via the southern route would take about 80 mins. In similar conditions travelling via a new route would take about 45 minutes, so significant travel time savings and enhanced connectivity can be achieved.

26. The development of longer distance links should not detract from the chronic capacity problems on the A34 between Oxford and the M40 and growing problems on the section between the M4 and Oxford. These are a constraint on successful development within the Knowledge Spine, through increasing the costs of travel and interaction within Oxfordshire and to other centres on the Oxford-Milton Keynes-Cambridge corridor. A longer term Expressway network upgrade will be needed as well as shorter term upgrades, which could form part of the longer term solution if a planned, phased approach is developed.

#### Rail solutions

27. East West Rail will establish a strategic railway connecting Reading and the Thames Valley via Oxford and the Oxfordshire 'spine' with the Milton Keynes and the South East Midlands and Cambridge / East Anglia. It is a vital missing piece in our country's strategic rail network, and will restore a strategic transport corridor of regional and national significance - essential to improving connectivity drive growth in the economy of England, and meeting the very significant forecast growth in rail use predicted on this corridor.
28. The original "Varsity Line" between Oxford and Cambridge was closed in the 1960s with only the sections between Oxford/Bicester and Bedford /Bletchley retaining passenger services. Currently, rail journeys between Oxford and Cambridge (via London) can take in excess of 3 hours. The only other public transport option, the X5 coach service, takes between 3½ and 4 hours via Milton Keynes and Bedford.
29. The East West Rail investment programme and new East West Rail services are vital to support planned housing developments and the creation of thousands of new jobs. It has support from Local Enterprise Partnerships in the South East Midlands, Oxfordshire and Berkshire Thames Valley; and strong political support in Westminster from an All-Party Parliamentary Group. A joint delivery approach means that the combined expertise of Network Rail and local authorities within the East West Rail Consortium (which is making a substantial financial contribution) is being used to accelerate delivery of the project.
30. The key projects being progressed in the EWR programme (see Appendix 2) are:
- Phase 1 – Western Section stage 1, upgrading/extending Oxford to Bicester services to London Marylebone via a new station at Oxford Parkway. Open from Oxford Parkway October 2015, from Oxford (central) December 2016.
  - Phase 2 – completion of Western Section (core scheme), enabling direct services connecting Reading/Oxford to Bedford, Milton Keynes and Aylesbury and new cross-country routes. Approved by central Government in 2012, currently preparing for a Transport & Works Act order to construct the necessary infrastructure, services expected to start around 2020.

#### *Future Phases*

- Central Section - a preferred route between Bedford and Cambridge via Sandy has been agreed, the next stage is to secure a funding commitment and commence detailed design work and consultation.
- Western Section (enhanced scheme) - additional infrastructure to enable more frequent services including additional cross-country and freight services

- Eastern Section – extension of services from Cambridge to Norwich/Ipswich and Eastern ports, currently being scoped.
31. Completing East West Rail would provide a minimum of half-hourly trains between Oxford with Milton Keynes and Bedford with travel times of 40 minutes and 60 minutes respectively. The travel time between Oxford Cambridge would be around 100-120 minutes depending on service pattern.

#### Preferred Transport Strategy

32. Oxfordshire's priority is for an early completion of the Western section of East West Rail, in line with Government and Network Rail commitments, along with early progression of the central section to complete the connection to Cambridge and any necessary upgrading of the Western Section to allow high frequency traffic.
33. Our view is that an upgrade to strategic highway connections is very likely to be required as a complement to this rail investment, and options for an Oxford to Cambridge Expressway need to be examined. However the strategy and scope of this scheme should not be finalised until the likely impact of the complete East West Rail infrastructure has been determined. This will then enable the scale of additional connectivity needs across the corridor to be established.
34. Consideration should also be given to options for resolving short term issues (through incrementally improving the current routes) in advance of any major new route between M40 and M1, including consideration of how this could route be developed in phases, linked to planned and potential growth. Any delay to a final decision on the precise nature of the Oxford-Cambridge connections should not, though, be a source of delays in progressing the much needed improvements to the A34, which could be progressed as an initial phase of the Expressway project.
35. However an infrastructure led solution is not likely to be sufficient in itself to meet the challenges along the Oxford-Cambridge corridor over the next few decades. In addition to the necessary investment to plug the infrastructure gaps, a fresh approach to planning and delivering both transport and development is needed to successfully and sustainably connect the places where people live and work.

#### *Does the corridor require better connectivity to other centres of growth?*

36. At the Oxfordshire end of the corridor the logical extensions would be to Reading and Swindon. They are both areas which have enjoyed and are planning further expansion within the hi-tech, knowledge based economy.
37. This requires new infrastructure beyond that already planned - although there are relatively high standard road and rail links to Oxford, there would be a need for investment in rail infrastructure between Swindon and Didcot, and between Didcot and Oxford (where both sections are predominantly only two track) as the railway is fast approaching capacity based on current and already proposed service patterns. There would also be a need for A34 capacity increases.
38. Beyond these Swindon is a gateway to Bristol, South-West England and South Wales while Reading links to Basingstoke and the South Coast ports, which have also seen considerable growth which is likely to continue.

***Does the Cambridge – Milton Keynes - Oxford area, including Northampton, form a recognisable economic corridor?***

*What factors unite the area?*

39. Towns and cities along the corridor are united by their strength in innovation, research and development and their willingness to allow new ideas to be demonstrated.

*Would greater emphasis on corridor planning and decision making benefit local communities and economies? Would that same emphasis on co-ordinated planning and decision making provide wider benefits for the UK economy?*

40. A co-ordinated approach to planning and decision making could help to maximise the value from investment. As the corridor includes some of the fastest growing parts of the national economy this would benefit country as a whole. A structure of corridor wide planning would also create greater confidence for investment, both from within and from outside the corridor, and consequently secure more funding for the corridor.

*Should the adjacent towns and cities be incorporated into the corridor in terms of growth and infrastructure planning?*

41. There is the opportunity to draw in adjacent, fast growing towns that complement this activity and/or provide development potential (including housing) to support it. As well the towns mentioned above this could include Aylesbury, Northampton and perhaps High Wycombe. However the more that the area is stretched the more diluted any potential investment is likely to become and therefore the less useful the concept might be as a vehicle for growth.

**Describe your vision to maximise growth, maintain a high quality environment, and deliver more jobs and homes across the corridor over the next 30 years**

42. We want to secure investment needed for strategic and local infrastructure and deliver jobs and homes to unlock the potential of Oxfordshire's knowledge rich economy. This will allow Oxfordshire to achieve its full contribution to the UK's growth ambitions and mean that people living and working in the County are more able to afford homes within a reasonable commuting time to their place of employment, are able to access job opportunities, and have a greater housing choice.

43. Our ambition is:

- to enable the delivery of 100,000 homes and 85,000 jobs by 2031;
- to support well planned growth in the 'Knowledge Economy Spine' to accommodate high growth innovation led business and employment opportunities;
- to prioritise investment in infrastructure that opens up housing markets and job opportunities whilst managing the impact on communities and the natural environment;
- to deliver a more responsive mix and range of housing to support the local economy and meet the needs of our residents (including starter homes and key worker accommodation for the health, education and research sectors to meet the needs of local employers and support growth, as well as supporting our younger residents into home ownership and our growing older population to access retirement and extra care housing); and
- to build upon our existing partnership arrangements to support an integrated approach to strategic planning and investment in infrastructure and housing and develop innovative new mechanisms to deliver housing more effectively

*What does that mean for growth and infrastructure investment in your area?*

44. Cities find it difficult to work across departments and boundaries. Breaking down silos and joint working between departments and across boundaries will allow coordinated data, knowledge and budget sharing to enable more effective use of resources and allow innovation projects to move from concept to trial more effectively. This collaborative approach also allows councils further access to the skills and knowledge within the universities, providing potential savings against a traditional route of using external consultants for expert advice, while also being part of developing best practice and another opportunity to raise the profile of the councils in this field.
45. The approach would support the respective councils' ambitions for intelligent transport and delivering a *"Smart Creative Heartland"*. The increased level of data and understanding of the areas that the approach would develop also puts the councils in a stronger position for major projects bids through supporting the business case for more complex projects and then targeting the project investment with a higher level of understanding of the problems.
46. The approach would also provide an enhanced level of data and analytics which would provide the basis for enhanced total place-based budgeting and project development an approach many major investors in smart sector are looking to adopt themselves to inform business models for smart projects that are often cross sectors and more complex than traditional infrastructure projects. The approach could also inform the development of business models for delivering place services in an alternative way.

*What steps are currently being taken to realise the vision and what more needs to be done?*

47. Oxfordshire County Council has outlined such an approach in its Science Transit Strategy for the Oxfordshire Knowledge Spine and we are now working with England's Economic Heartland partners to apply a similar approach throughout the Oxford-Cambridge corridor. Science Transit is a fully integrated public transport system that supports the concept of *"Mobility As A Service"* to become a reality, it connects the corridor centres of innovation and economic growth and the universities across Oxfordshire (see Appendix 3).
48. This means people using Science Transit will be able to use high-frequency rail and bus services using a single 'smart' transaction to plan their journeys using real-time information and updates supported by integrated information systems. This will provide travellers with informed choices and allow operators to manage the transport system as a whole in real-time, and pay for their journey with cashless payments enabled via use of the latest smart transaction technology.
49. Investment in new infrastructure along the corridor should adopt the principles set out in the Science Transit Strategy to ensure investment in infrastructure links together our Innovation Hubs, and connect them to locations of identified housing and economic growth across the county. An Oxford to Cambridge corridor must represent a credible and viable alternative to car use by meeting people's basic mobility needs, as well as their expectations of speed, comfort, reliability, environmental sustainability, affordability and journey experience.
50. The vision is to ensure local transport links are deeply integrated with mainline rail and strategic highway connections to London, Heathrow and neighbouring towns along the Oxford to Cambridge Corridor. New interchange locations will connect new and existing public transport services with walk, cycle, car-based, and air travel modes. Smart uses of real-time data generated through the effective coordination of mobility networks, and



system users' movements, will increasingly enable people to seamlessly combine multiple travel modes to complete their door-to-door journeys.

51. To enable this seamless journey planning to become a reality, Oxfordshire County Council is piloting the UK's first intelligent mobility platform covering all aspects of the UK transport network. This platform integrates all the disparate elements that influence the way we move around: operational road, rail and car data, live positioning, delays and disruption.
52. The platform integrates independent transport networks into one seamless experience and actively engaging with every user of that super-network in a truly personalised way. Car share schemes, bike schemes, traffic and air quality management, electric vehicle schemes are all included. This is not just real-time information, but predictive, personalised information – delivered only to the people who need to know. Rolling this service out across the Oxford – Cambridge corridor will allow truly personalised travel planning to be weaved into the everyday behaviour of anyone who interacts on with the corridor.
53. Developing a vision and the building blocks to support this approach has meant this is already happening in Oxfordshire with the County Council working in collaboration, with research, social enterprise, private and other public sector community to deliver data exchange platforms and personalised journey systems, for example an innovative SME called Zipabout are developing their Mobility as a Service platform for launch in Oxfordshire in Autumn 2016.
54. Five inter-related and inter-dependant objectives underpin the development of the Science Transit system. These are to:
  - Embrace new technologies and data innovation to unlock intelligent mobility;
  - Accelerate local growth through innovative R&D;
  - Improve connectivity between places where people live, work, and spend their leisure time;
  - Integrate transport and land use planning to improve non-car based mobility;
  - Deepen public & private sector partnerships.
55. To achieve this Science Transit will actively seek to exploit:
  - New and emerging technologies that improve the environmental efficiency and sustainability of conventional transport systems;
  - Ticketless and cashless payment systems that are expected to enable seamless interchange across travel modes in the future;
  - New and innovative uses of data that are being collected from transport networks in real time;
  - Entirely new modes of travel that are emerging from the intersection of technology, data and transport system research & development;
  - Partnerships with transport operators, developers and businesses to improve timetable co-ordination, service frequencies and cycling and interchange infrastructure.

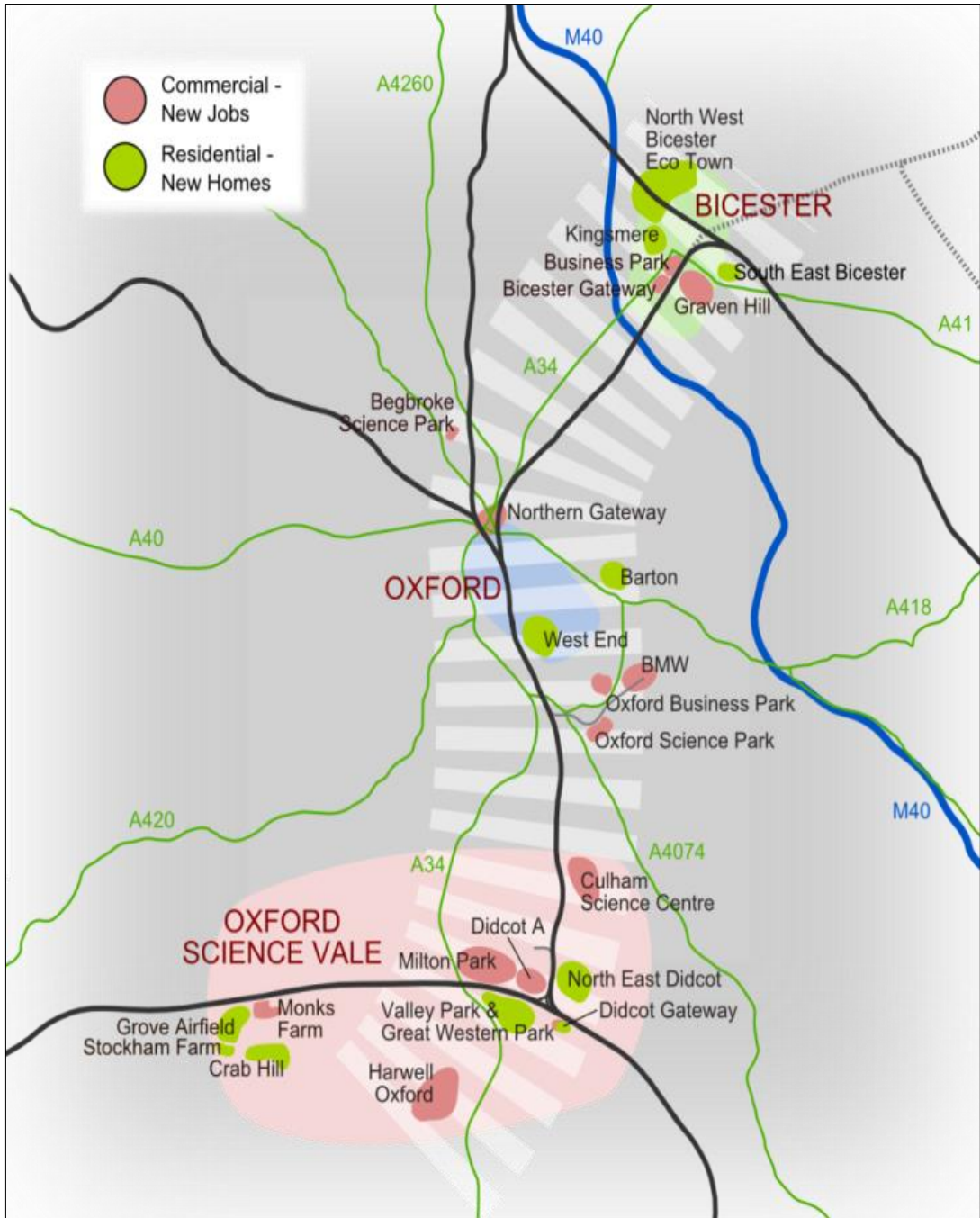
The stages to implementation across a wide range of transport innovation can be seen in Appendix 4.

**Are there lessons to be learnt from previous initiatives to maximise the potential of the corridor?**

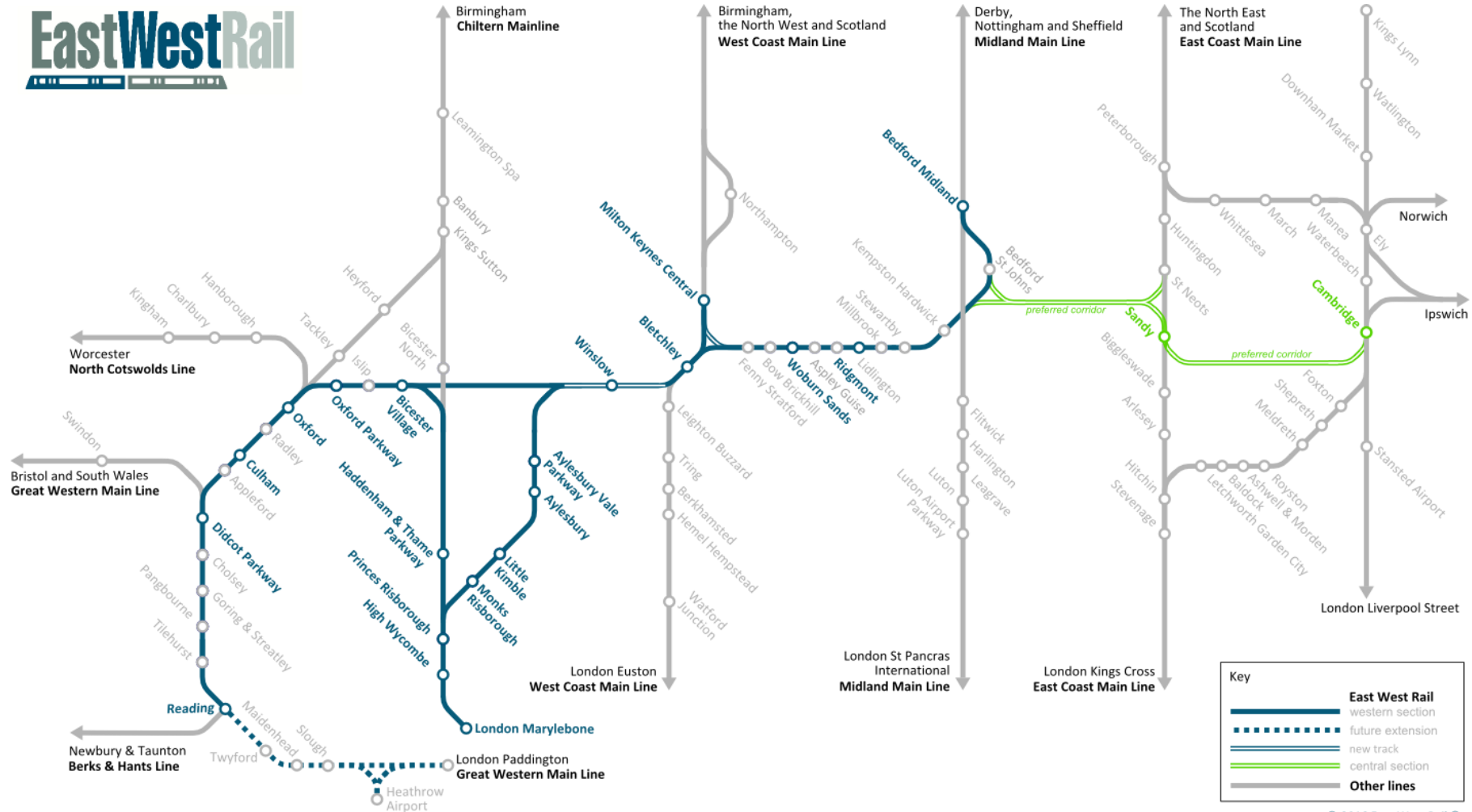
56. The distinctions between private and public actions and investment are becoming less important and can even be a hindrance in developing and implementing the new transport systems which Science Transit seeks.
57. For the SMART Oxford: Culham City project an Advisory Board has been established and is engaging with a wide variety of 3<sup>rd</sup> parties. Culham City has support from delivery partners including the MobOx partnership (MobOx Foundation, Oxford University, Oxford Brookes, Oxfordshire County Council and Oxford City Council, Siemens, Bosch, Common Wheels, Oxford Bus Company, Bluebird, Zeta Automotive, Satellites Applications Catapult, ByBox, Land Securities, CoreThree, ITO, Gnewt Cargo, Oxbotica, Virtual Viewing, Chiltern Trains, Preston Motorsport) and the Future Cities Catapult / Transport Systems Catapult (hence all the partners associated with LUTZ and Autodrive).

**Are you aware of any examples of UK or international good practice, for example in respect of new technology, local frameworks or the built environment, that are relevant to this review?**

58. Oxfordshire has actively developed a Research & Innovation team to explore new opportunities in delivery and management of infrastructure. This has been a catalyst in developing a collaborative innovation ecosystem that has already established Smart Oxford and a Community Interest Company (MobOx Foundation CIC) with partners in the university and private sectors specifically to look at innovation and living lab applications to deliver future of mobility in Oxfordshire. We also have the Low Carbon Hub, leading the application of a Social Enterprise in the energy infrastructure market, innovating quickly to support changing market demand. These all have in common a goal of more efficiently utilising existing infrastructure while developing new business models and opportunities which leverage the “thinking power” and entrepreneurial spirit that Oxfordshire and the Oxford–Cambridge corridor has at hand.
59. Other areas across the review area have also developed collaborative working groups, to truly develop innovative approaches to infrastructure these local collaborative groups should be utilised to inform how infrastructure can be delivered and managed in an optimum way for this area while potentially opening up major opportunities to grow expertise in emerging markets such as intelligent mobility and personalised energy management systems
60. Oxfordshire is the lead authority in the consortium which has applied for Local Growth Fund support for the SMART Oxford: Culham City project. This project will enable the commercial deployment of autonomous systems across the Oxfordshire Knowledge Spine creating an autonomous transport service as part of the Science Transit Network. Culham City will be used for long term testing of integrated intelligent mobility solutions in a range of different real environments, enabling people to engage with new transport solutions under the watchful eye of providers, regulators and investors, to establish an evidence base for commercial decisions. These trials will start on the secure, fenced UK Atomic Energy Authority site and will progress in controlled steps from a private area towards the main gate before being allowed out into the wider world.

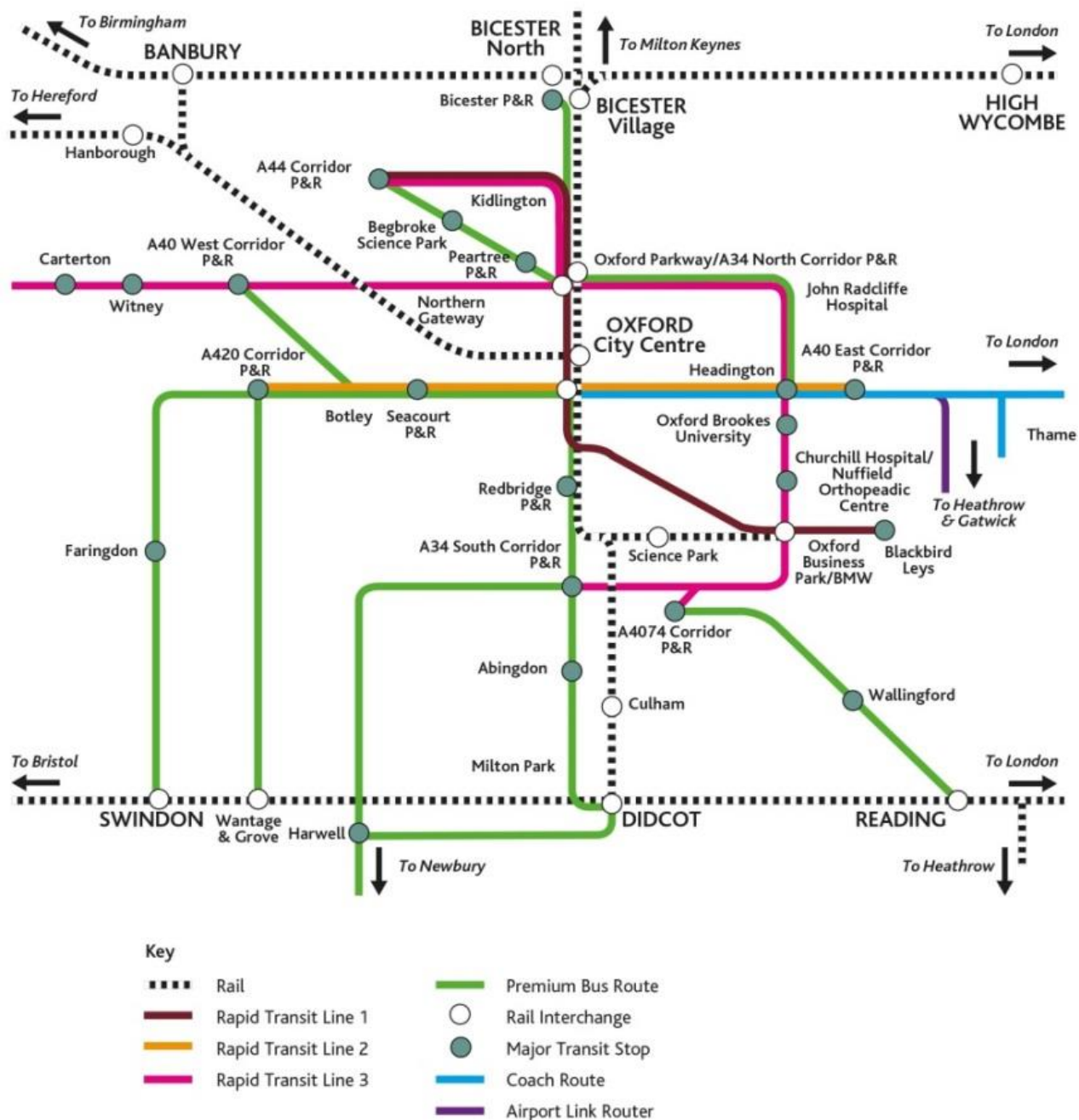


**Appendix 1: The Oxfordshire Knowledge Spine**



Key	
	East West Rail western section
	future extension
	new track
	central section
	Other lines

Appendix 2 – East West Rail Western and Central Sections



**Appendix 3 – Proposed Oxfordshire Science Transit Network**



		Stage 1	Stage 2	Stage 3	Stage 4	Stage 5	
Relevant to all	Intelligent data-driven mobility	 Limited automatic data collection	Increased data collection and use by individual organisations	Some sharing of schedules and pricing data between different stakeholders	Open data sharing platform for real-time traffic and local public transport data	Data shared by all mobility services. Real-time & historic feeds power predictive models and autonomous systems	
	Priority	 Shared lanes in mixed traffic no priority	Shared lanes but with some preferential treatment	Designated lanes, heightened priority	Dedicated lanes and segregated facilities	Exclusive alignment with full grade separation	
High Quality Services	Vehicles	 Functional	Exterior aesthetic and ride/comfort features	Improved boarding accessibility and information features	Diversified vehicle sizes, materials, capacities, alternative fuels	Guidance, propulsion and demand responsive routing	
	Stops/ Interchanges	 Basic flag, some shelters	Improved shelters, signage and amenities	Additional passenger information, safety and security amenities	Enhanced station services and fare collection	Enhanced berthing, loading and land use features	
Seamless Interchange	Route structure	 Basic regular service	Improved service frequency with transfer connections	Extended stop distances with skip-stop and express services	Regional coordination, high frequency and reliability	Flexible route options to increase one seat rides, on/off alignment operations and convenient transfers	
	Publicity/ branding	 Limited	Marketing with minimal differentiation from other routes	Wider use of branding to differentiate services	Marketed and branded as a separate tier of service	Full branding and marketing as single service system	
Easy to use mobility system	Fare collection	 On-board only	Increase pre paid fare sales	Proof of payment fare systems	Electronic fare collection using smart card systems	Multi modal multi operator ticketless travel and e-payment	
	Information	 Basic timetable information at stops and public locations	Web-based information, improved distribution, some real time information	Wider roll out of real time information	Real time information at all key stops and public places	Personalised, context-aware information and alerts through multiple digital devices.	
Smart mobility in formation	Handling small demands	 Car and taxi based	Car, bike, and taxi sharing schemes, bike hire service	Semi-flexible bus services, Car Club	Demand responsive small vehicles. E-bike hire system	Intelligent demand responsive transport	

Appendix 4 – Oxfordshire Science Transit – Stages to Implementation