

The Innovate UK response to the National Infrastructure Committee's call for evidence on London's Transport Infrastructure.

1. Innovate UK is the UK's innovation agency, a non-departmental public body sponsored by BIS. It is the prime channel through which the Government incentivises innovation in business. Innovate UK is business-led. Our governing board and executive team is comprised of experienced business innovators and experts. We work with people, companies and partner organisations to find and drive the science and technology innovations that will increase productivity and exports and grow the UK economy.
2. We are working to:
 - Accelerate UK economic growth by nurturing small high-growth potential firms in key market sectors, helping them to become high-growth mid-sized companies with strong productivity and export success;
 - Build on innovation excellence throughout the UK, investing locally in areas of strength;
 - Developing Catapults within the national innovation system, to provide access to cutting edge technologies, encourage inward investment and enable technical advances in existing businesses.
 - Working with the research community and across government to turn scientific excellence into economic impact, and deliver results through innovation.
 - Evolve our funding models to explore ways to help public funding go further and work harder, while continuing to deliver impact from innovation.
3. In line with our strategy¹ we operate across Government and advise on policies which relate to technology, innovation and knowledge transfer. We also support Government departments to become more efficient by supporting them in developing innovative solutions through harnessing the creativity that businesses can offer.
4. Innovate UK was established in July 2007 (as the Technology Strategy Board). We have committed more than £1.5 billion to date and independent evaluations have established that overall Innovate UK has created over £6 of GVA for every £1 it has invested and 7 jobs for every business it has invested in. Over the last 8 years this has added up to delivering a total of £7.5Bn and 35,000 jobs. The private sector more than matches that investment, doubling the power of public sector money, and we have directly supported over 6,500 companies. We work with nearly every University in the UK to stimulate the commercialisation of leading-edge academic research and innovation.
5. Transport Systems as well as vehicle technology across Automotive, Aerospace, Marine and Rail have had a major focus within Innovate UK over the last eight years. We have placed significant investment in collaborative R&D partnerships, driving growth within businesses and supply

¹ 'Concept to Commercialisation: A strategy for business innovation, 2011-2015'.
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/360620/Concept_to_Commercialisation_-_A_Strategy_for_Business_Innovation_2011-2015.pdf

chains, both nationally and for exports. These areas continue to be prime focal points as we build on success in these sectors of national importance by delivering the Advanced Propulsion Centre and Aerospace Technology Institute programmes on behalf of the Department of Business, Innovation and Skills.

6. The Transport sector has grown into one of Innovate UK's key priorities. Our aim is to help innovative UK businesses to take advantage of the opportunities that a rapidly changing transport system will present, both in the UK and in overseas markets. Over the last parliament we have invested up to £70m per year of our core budget in support of hundreds of innovative businesses developing new products across the transport sector, from new powertrain technologies for low emissions buses, through to low noise aircraft systems and intelligent mobility services. Our focus from 2007-2015 grew from the Low Carbon Vehicle Innovation Platform to cover Aerospace, Rail, Marine and Transport Systems.
7. Innovate UK supports businesses in two main ways. Firstly, we provide funding to allow development of high potential, ground-breaking new technologies and products that are too early and too risky for the private sector to fund alone. Secondly we help businesses connect to the right partners, expertise, test facilities, financiers and influencers that can accelerate their route to market. A key component of innovation is knowledge exchange through networks. To drive this at a national level Innovate UK has invested £1.5bn in establishing world leading Catapult centres, which are designed to transform capability for innovation in specific areas of specialism to enable future economic growth. These centres launched by Innovate UK, provide critical expertise and test facilities to businesses in developing new products. Within near reach of London with a focus on transport challenges we have Transport Systems and Satellite Applications, and inside the capital we have the Future Cities and Digital Catapults. Additionally, the national network of High Value Manufacturing Catapults are extremely important for grounding the manufacturing of new transport technologies in the UK.
8. The demand for transport and its infrastructure is proving to be a critical challenge for the UK in enabling businesses to function and to support economic growth through the movement of people and goods. Notwithstanding social development, wellbeing and environmental impacts, we see great potential in balancing demand and optimising connectivity through evaluation of new innovations and technologies and how these trends can offer greater utilisation of the national transport infrastructure. Equally advancements in new innovation for asset management and connectivity can provide cost savings in operational maintenance for local authorities.
9. We have shown how major demonstrations of new innovations and technologies, such as electric vehicles, can attract international investment into the UK and accelerate market adoption of low emission technologies and reduced risk for industry to bring new products to market. New business models provide value across the range of transport issues and we have also seen valuable insights into the complexities of the network users and how disruptive and innovative thinking can drive a change in behaviour towards transport.
10. Expertise and sector knowledge at Innovate UK can bring significant change in the transport market. Through working closely with industry and evaluating past projects Innovate UK provide timely and value added interventions to drive supply chain growth and productivity. We demonstrate how the collaboration across industries can open new value to capture and meet the future challenges of transport.

11. The value of working closely with UK Governments on specific societal challenges can bring about timely change in regulation and standards to match the pace of technology and innovation and how these drive new customer demands. Projects funded through Innovate UK show how risk reduction through targeted innovation investment can overcome perceived challenges and drive collaboration across industries on a common challenge. Innovate UK welcomes the National Infrastructure Committee's inquiry into London's Transport Infrastructure. Set out below is our response to the questions raised by the Committee.

1. What are the major economic and social challenges facing London and its commuter hinterland over the next two to three decades?

12. London's ability to move people and goods over the next two to three decades to support economic growth and social wellbeing will be challenged by the limited transport network capacity through its geographic constraints and how it has evolved in construction terms as a city over the years. Increasing population through migration, aging and urban growth, places significant challenges onto London and its existing transport infrastructure.

13. Drivers spent more than 250 hours idling in London traffic in 2013, which is double the UK average – and this is set to increase to 299 hours in 2030, equivalent to 40 working days a year. Although less than a third of Londoners commute to work by car, the cost of living and the value of time for the capital's 1.4 million car commuters is at such a premium that in 2030, it is estimated London will incur £9.3 billion from traffic congestion, an increase of 71 percent from today, costing each car commuting household more than £4,000 a year by 2030.

14. The commuter today is already witness to train overcrowding and congested roads and the frustrations and stresses in the daily commute. Today's rail commuters already consistently exceed available capacity in and out of London during the morning and evening peaks (demand is 104% of capacity) and these trends look set to continue. Demand exceeds capacity at mainline stations including Paddington at 110%, Moorgate 108%, Blackfriars 108% and St Pancras 107%.

15. Improving public transport reliability, predictability and accessibility will be challenging for the transport system of the future due to increasing demand from a diverse demographic as well as vehicle and connecting infrastructure security. Other social challenges include safety for pedestrians and cyclists. Additionally the commuter, traveller and tourist face air quality concerns.

2. What are the strategic options for future investment in large-scale transport infrastructure improvements in London - on road, rail and underground - including, but not limited to Crossrail 2?

16. There are a number of options which include:

- enhancements in signalling (through ERTMS or ETCS) on the existing mainline network, which has the potential to significantly increase capacity by enabling closer running of rail services;
- further roll out of future rail technologies - such as autonomous tube rolling stock (as in use on the DLR);
- electrification of non-electrified London stations will contribute to an accelerated rail timetable and in addition to investing in large-scale transport infrastructure, a range of incremental gains may also be realised by strategic delivery of a range of lower-cost options to enable faster passenger loading, dwell times at stations, optimised train driving aids and smart technology to support passengers in making informed travel choices;

- the strategic consideration towards the reduced use of the private car in central areas and incentives towards zero emission vehicles. Better use of park-and-ride out on the peripherals of the city such as the M25, with driven or driverless/autonomous vehicles serving individual's needs in accessing the city;
 - to benchmark international initiatives such as Frankfurt, Amsterdam, and other large EU cities that have tackled these issues, e.g. wide use of street-level trams, simple ticketing, transparent and cost effective pricing, radial as well as axial routes to encourage businesses to site themselves out of the city centre;
 - a strategic and tactical view to consider new business models in how operation of local transport such as taxis and buses can enable a more on demand service rather than traditional methods of delivering a public transport services;
 - a push for greater optimisation of the River Thames as a means of moving people and goods efficiently, providing greater physical connectivity with additional bridging. Providing better commuter and traveller information through enhanced and accurate information through wireless connectivity;
 - infrastructure investment should also consider the optimisation of transport within London as a system. Using innovations in infrastructure intelligence to drive greater intermodal connectivity and ways of balancing the transportation network;
 - to build upon the demonstrated benefits of smart infrastructure by the Cambridge Centre for Smart Infrastructure² to realise those benefits across the whole lifecycle of future infrastructure projects, from design and construction through to operation; and,
 - to support shifts in propulsion systems, alternatively fuelled vehicles need infrastructure including rapid electric charging points and hydrogen refuelling.
- **How should they be prioritised, taking account of their response to London's strategic transport challenges, including their impact on capacity, reliability, journey times and connectivity to jobs?**
17. Priority should take into account the ability to smooth transportation flows and optimise capacity. Connectivity to jobs and businesses drives economic growth, reducing journey times and congestion enables greater mobility of both people and goods. This could be achieved through an in-depth study, ideally with the support of specialist agencies including the DfT, TfL, modelling tools. This could be done through the Transport Systems and Future Cities Catapult and other specialist agencies as appropriate.
- **What might their potential impact be on employment, productivity and housing supply in London and the southeast?**
18. We would recommend a study ideally with the support of specialist agencies including the DfT and Transport for London to assess trends in innovation and technology and matching that with population, migration and business growth forecasts. This would assess the impact of large-scale transport infrastructure improvements in London on employment, productivity and the supply of housing.

² The Cambridge Centre for Smart Infrastructure is an Innovation and Knowledge Centre, jointly funded by Innovate UK and EPSRC to bring research into smart infrastructure into practice through a series of technology demonstrations with industrial partners. Led by Professor Lord Mair, CSIC has been involved in both Crossrail and the London Bridge upgrade project to demonstrate the benefits of smart infrastructure and are in discussions with all the major infrastructure projects to continue this work. See <http://www-smartinfrasturcture.eng.cam.ac.uk/who-we-are>

3. What opportunities are there to increase the benefits and reduce the costs of the proposed Crossrail 2 scheme?

19. There are opportunities for Crossrail 2 to be explored through modern digital engineering practices, such as smart infrastructure and maintenance. Condition monitoring systems and intelligent sensors would help to reduce operational costs. The digital revolution is enabling greater mobility of people through smart ticketing, ticketless barriers and greater system connectivity. Learning from industrialised sectors such as Aerospace and Automotive in the design and development of long term programmes and process innovations should be explored by the construction sector and therefore encouraged by the public sector procurement. Specification freeze, engineering change control and complete design for manufacture ownership are lessons that can be learnt.
20. It is expected that the proposed Crossrail 2 project will be fully BIM level 2 migrating to level 3 compliant (a project heavily supported by Innovate UK), and will be able to benefit from the legacy of Crossrail 1 and other mega infrastructure programmes such as Thames Tideway and HS2 phase 1.
21. Further benefits could be realised through the use of novel building methods such as offsite manufacture in the construction phase. Equally instilling a culture for innovation within the programme and driving innovative practices into the development frameworks from the funder should challenge traditional design and engineering practices, standards and regulations and drive new methods for assessing risk through a balanced portfolio. To drive innovation into the supply chains through accelerated procurement specification and requirement capture to deliver a more cost effective railway, rolling stock, system and construction.

4. What are the options for the funding, financing and delivery of large-scale transport infrastructure improvements in London, including Crossrail 2?

22. This is for others more expert in the delivery of large-scale transport infrastructure to comment.
 - **What is an appropriate local and regional contribution - given the potential distribution of benefits to business, residents, transport users and the wider economy - and how could this be achieved?**
23. This is for others to comment.
 - **What innovative funding mechanisms could be considered to support delivery of key schemes?**
24. A funding scheme that considers and drives cross sector innovation. To include transport modes, digital, construction, local regions and attracts emerging non transport industries to provide innovative systematic products and services in the design and operation of the transport system.

These could include Innovate UK's SBRI³ and CR&D⁴ mechanisms and the national Catapult centres⁵, supported by a London Innovation Fund.

5. How have major metropolitan areas in other countries responded to similar challenges and priorities? Are there any lessons to be learned and applied in London?

25. The challenges facing London are very similar to other cities globally, as population growth and the demand for transport, travel and social wellbeing drives expectations of the transport network. In many cases demand is outstripping supply. These lessons are being learnt by London. Global benchmarking and collaborations would provide accelerated learning and reduced trial costs.

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³ The Small Business Research Initiative (SBRI) is a programme that addresses public sector needs with solutions from businesses via pre-commercial procurement contracts. More information: <https://sbri.innovateuk.org/>

⁴ Collaborative research and development (R&D) co-funding projects involving partnerships between businesses and between business and academia, it reduces financial and technical risk and encourages knowledge exchange, supply chain development and parallel working on complex challenges. See <https://interact.innovateuk.org/-/collaborative-r-d>

⁵ The Catapult centres are a network of world-leading centres designed to transform the UK's capability for innovation in specific areas and help drive future economic growth. See <https://www.catapult.org.uk/>