

Response to
National Infrastructure Commission's
Call for evidence:
London's Transport Infrastructure

University College London

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Contents

| | |
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| Contents | 2 |
| 1. Executive Summary | 3 |
| 2. Research Capability at University College London | 4 |
| 3. Response to Questions regarding London's Transport Infrastructure | 5 |
| 3-1. What are the major economic and social challenges facing London and its commuter hinterland over the next two to three decades? | 5 |
| 3.2. What opportunities are there to increase the benefits and reduce the costs of the proposed Crossrail 2 scheme? | 7 |
| 3-3. What are the options for the funding, financing and delivery of large-scale transport infrastructure improvements in London, including Crossrail 2? | 10 |
| 4. References | 12 |

1. Executive Summary

This document consolidates the response of the academic community at University College London (UCL) to the National Infrastructure Commission's call for evidence regarding future investment in London's transport infrastructure (published 13 November 2015).

In response to *Question 1) what are the major economic and social challenges facing London and its commuter hinterland over the next two to three decades?*, we noted the issues around London's housing market and demographics. Whereas London's housing market is becoming a field for financial game by investors, the potential risk would be that expensive house prices/rents would discourage young generations from coming into London, although they are in fact an engine of London economic development. A step change would be required on our approaches to these, which should be synthesised with transport planning, including use of Residential Social Landlords who do not need short-term returns but provide a platform for financially less advantaged people. A local council tax supplement could be another means.

In response to *Question 2) What opportunities are there to increase the benefits and reduce the costs of the proposed Crossrail 2 scheme?*, this report highlights opportunities regarding orbital transport systems as well as rail systems that go beyond the traditional boundaries of London, which should be integrated to the proposed radial and through-centre systems, such as Crossrail 2. Because Train Operating Companies cannot consider investment and return beyond their franchise periods, appropriate arrangements are necessary from long-term strategic viewpoints. In addition, consolidation of existing train depots as well as multiple-platforms at the core section are suggested to maximise the benefit of the proposed Crossrail 2.

For *Question 3) What are the options for the funding, financing and delivery of large-scale transport infrastructure improvements in London, including Crossrail 2*, we suggest a) line-based fare surcharge, adapted in Tokyo, b) use of the Games 2012 Tax system, and c) consolidation of infrastructure development and train operation when contracting out the project. Separating station infrastructure development and maintenance from the construction of the line, and bringing private funds to the station infrastructure is one possible approach. China is experimenting privately funded metro station maintenance by local homeowners, whereas in the Maglev train line of Japan stations except termini are all funded by private companies and local governments. These are also possible approaches.

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2. Research Capability at University College London

UCL is a global research leader in the design, delivery and management of sustainable and resilient infrastructure.

UCL holds some £57M of funding, from the UK Engineering & Physical Sciences Research Council (EPSRC) alone, for research on infrastructure related challenges in the transport, energy and construction sectors. UCL's research strengths in the field are truly multidisciplinary, spanning: transport engineering, structural engineering, advanced spatial analysis and big data analytics, construction and project management, sensors and geomatic engineering, and socio-technical energy modelling and analysis. Major centres of excellence at UCL include the Centre for Advanced Spatial Analysis (CASA), the Centre for Transport Studies (CTS) within the Department of Civil, Environmental & Geomatic Engineering, the cross-Faculty Transport Institute, and the OMEGA Centre for Mega Projects in Transport & Development, based in the Bartlett School of Planning.

In the 2014 Research Excellence Framework, UCL was the top-rated university in the UK for research strength, by a measure of average research score multiplied by staff numbers submitted. It was ranked number in the UK in the area of Architecture, Built Environment and Planning (Unit of Assessment 16), and the in top ten in the field of Civil and Construction Engineering (UoA 14).

UCL is home to the EPSRC and ESRC funded International Centre for Infrastructure Futures (ICIF), as well as the Coordination Node of the £138M UK Collaboratorium for Research in Infrastructure & Cities (UKCRIC), led by Professor Brian Collins from the Department of Science, Technology, Engineering & Public Policy (STeAPP). Announced by the Chancellor in 2015, UKCRIC spans at least 14 universities and will lead the development of a coordinated, world class, infrastructure research community in the UK. UCL will take charge of infrastructure aspects of the £10M EPSRC-funded Internet of Things Research Hub (PETRAS), announced in early 2016, as well as its overall leadership under Hub Director, Professor Jeremy Watson (STeAPP).

3. Response to Questions regarding London's Transport Infrastructure

3-1. What are the major economic and social challenges facing London and its commuter hinterland over the next two to three decades?

[Response 1]

London's success as an economic, political, cultural and social centre is well understood and London's history and current dominant position both nationally and globally would strongly suggest that it has enduring characteristics that allow the next thirty years to be considered with some confidence.

With this as a non-controversial backdrop, the future of London can be speculated upon by drawing on a UCL authored report that itself drew upon both a day-long workshop involving senior representatives from the UK built environment and supplemental authoritative sources (UCL, 2015). The report is available electronically here:

http://issuu.com/ucl_cpm/docs/changing_demographics_151127.

Throughout the report there is repeated reference to London's potent attractiveness. This means that both London and its environs will continue to attract individuals, organisations and investment. The report had limited scope and only focuses on three forms of the built environment comprising key elements of our social infrastructure: housing, healthcare and education. To the intelligent and well-informed reader there will be nothing of great surprise as many of London's challenges are well understood. However, three issues or topics are worthy of highlighting:

- 1) That the housing problem that the UK is experiencing is the result of the 'game' played in, and through, housing and the type of players in this game. The UK housing game is distinct – it sees housing as being a social necessity (we all need somewhere safe and secure to rest) and, ideally and in terms of aspiration, our (citizens') biggest financial investment. This housing game is played out within a strict planning rule-set, now with a far more onerous financial set of challenges in terms of obtaining a standard and traditional mortgage. The current and recent result of the game played and its rules is the social utility of housing is overshadowed by the financial return – so housing moves from a fundamental social provision to a financial asset and resulting investment strategy. This game attracts a specific type of player in terms of supply. Rather than housing being seen as social right, it has become dominated by those seeking either asset appreciation or derived income from this asset. And here, to compound the issue, the asset is not the house or dwelling, but the land rights that are entwined with the dwelling. With strict limits on land use, the result of increasing demand is that those in control of developable land choose how, where and when to release that land (with housing built on it) so as to maximise their returns. Those able to buy such housing can, and do, store or even stockpile the financial asset without ever seeking to generate any form of social utility from it. This then has serious disruption and displacement effects. With this game in play, the rules of the game set and understood, and the players we have – there is no indication that anything significant will change over the next 20-30 years. Three strategic options are proposed for consideration:
 - a. Change the game – decouple the provision of housing as a social utility from that of a prime financial asset. Here there needs to be a cultural shift to the acceptance of

long-term stable renting as is found in many parts of Europe. It is possible and for some young Londoners this is already a reality. In terms of meeting this possible demand, there is evidence from sub-sectors such as student accommodation that institutional investors are attracted to stable renters. The shift will have to be mainly in dissuading the younger generation that owning their own home is the mark of true Britishness.

- b. The rules can be changed, most notably around the protection of the Green Belt, but this would be highly divisive. The move to allow 'permitted development' to bring into active use redundant office space has had large unexpected consequences as active offices were converted – again this creating displacement and disruption.
 - c. New players can be attracted to 'the game' via changing fiscal and other regulatory rules. This could be through strengthening those Residential Social Landlords as represented by bodies such as the Peabody Trust. This 'third sector player' approach, being neither private sector returns driven, nor overtly public sector, could take a long-term stable view and, if given access to land and title over the property, would have a substantial capital asset base on which to borrow and invest.
- 2) That technological advances will allow or indeed encourage more and more kinds of activity to take place in our homes. London is primarily a location for work derived from knowledge and as ICT becomes more pervasive and powerful, so knowledge workers will have options as to where to communicate in person or digitally. The trajectories of retail is telling – it has made the move online and this trend is set to continue as more shopping is done online. Similarly social exchange is taking place on digital platforms, and over the next 20-30 years we can expect more 'telecentric' health and education services to appear and become routine. Online learning is already established. In health, the cheap and easily installed monitoring and sensing technologies will enable remote healthcare – of both preventative (wellbeing) and response (remedy).
- 3) As a result of both technological shift and the possibility of more fear as a result of more crowding and the rise of extremism, there is a realistic prospect of strata of London's population retreating to their homes. This then may see London occupied more by visitors and tourists than it is by those living and working in London. This occurred in small measure during the 2012 London Olympic Games, and this may shift established daily and seasonal patterns of movement.

[Response 2]

One great indicator of - and clear factor in - London's success as a global city of entrepreneurial and cultural excellence is its ability to attract young people to live and work in the city. Young people flock to London, bucking the trend in terms of net migration to London, with 20-29 year olds the only age group demonstrating a net positive inflow into London from other UK regions (ONS, 2013). Other age groups on balance leave London, to the South East in the large part, continuing to contribute to the economy but not adding the same dynamism as younger groups. London is also sustained through immigration of foreign-born nationals, who, contrary to media reports, are highly skilled and contribute positively to productivity (LSE, 2007). The development of London must ensure its continued attractiveness to these groups.

A significant challenge towards maintaining these benefits is finding places for people to live in and around London. The trend of increasing house prices in central and inner London does not look like abating any time soon, for a wide range of reasons. Twinned with a limited capacity for building new housing in central areas, will mean outer London and commuter belt towns become the only viable option for many of those wishing to move to or buy in London. As Marchetti's Constant (Marchetti, 1994) (and subsequent research from Zahavi, 1973, and Metz, 2008) shows, people are happy to travel further and further to work, but they generally are not happy to spend much more than an hour per day on commuting. There are no reasons to suggest that London introduces relative benefits that would significantly buck this trend. This limits the physical extent of London's commuter belt. While some jobs will drift towards being more easily conducted from home, a sizeable proportion of jobs (particularly those conducted by younger people) will remain located in central London.

There is a risk that, as demand to displaced to commuter belt towns well linked to central London, the benefits of lower costs and greater space will be reduced. This reduces further opportunities for younger and immigrant groups to find suitable housing, risking these groups looking elsewhere to take their labour, energy and ideas. As such, a focus of transportation infrastructural improvements should be on improving access to central London from outer London locations.

Beyond potential impact on labour, the subsequent displacement of lower income groups from central areas risks the reduction in cultural diversity, a strength of London as a global city, and potentially meaning London becomes a less interesting place to live. These combined factors ultimately risk London becoming a less attractive place to live and work, losing competitiveness both nationally and globally.

[Response 3]

From a classic transportation economics perspective, demand for commuting is derived rather than innate. In the case of London, the concentration of well-paid jobs in central London vis-à-vis the lack of affordable housing inaugurates the demand for excess commuting to access job opportunities. Charging a council tax supplement will not only capture the land value lifted by publicly invested transport infrastructure in London, but will also discourage the non-commuting investors from holding housing stock only as an income-generating asset, hence resolving the fundamental jobs-housing imbalance problem in London.

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

[Response 1]

Investment in transportation infrastructure should focus on enhancing public transportation services. While London has formed and expanded on road, transport provision over longer distances and of increasing numbers of people cannot be achieved through road expansion. Bold political leadership is required to make it clear that this must be the priority for investment, to ensure London's sustainable growth and continued success.

There are three main areas of opportunity for expenditure in transport infrastructure. First, involves significantly enhancing existing routes into central London from outer London and commuter belt locations, increasing speeds, improving capacity and expanding where necessary. Second, new infrastructure should improve the connectivity to and between outer London town centres, helping to promote their role as drivers of employment and productivity, reducing dependence on central London. And third, there should be a better integration of services, achieved through both infrastructural and organisational changes.

London is well served by a comprehensive distribution of public transportation services. However, these routes often lack sufficient speed, frequency and reliability of service. A priority should be placed on expanding these existing public transport services to growth areas in outer London and the commuter belt. Increased provision to these regions will ensure improved housing options for those wishing to work in London, increasing access to central London, and ensure adequate labour provision for central London employers. Specific extensions to existing infrastructure that should be considered are:

- Improve speed and frequency of regional rail and Overground services in south east London, taking these services closer to Underground level services. Make better use of hubs for interconnection between services where infrastructure currently intersect (e.g. at Peckham Rye, Crystal Palace or Tulse Hill).
- Improve Overground services to north East London, improving the link with the Victoria Line at Walthamstow.
- Improve capacity and frequency of rail services along north London lines to Welwyn Garden City, Hatfield and Potters Bar.
- Make better use of HS1 services to St Pancras via Stratford with increase in high speed services from Gravesend, Chatham, Maidstone and Ashford.
- Improve speed and capacity of services to Essex (Basildon, Brentwood, Southend).
- Extension of Victoria line from Brixton to Croydon via Streatham and Norbury.
- Extension of Bakerloo line to South East from Elephant and Castle (already under consideration).
- Ensure improved speeds and frequency along the Hertford East line to Broxbourne, Hertford and Ware (some provision is stated in Crossrail 2 proposals).

As a secondary priority, the provision of new services between outer London locations should also be considered. Increasing land prices in central London will increase the importance of outer London town centres as drivers of employment. Given increasing demand through central London, direct connections between centres should be considered. Overground services are currently not quick enough to provide the required connectivity. Priority should be given to north-south links in east and west London (e.g. Stratford to Lewisham and/or Bromley; Wembley to Kingston). The currently piloted Mini Holland scheme to provide direct and safe cycle routes into major town centres from surrounding areas should be expanded.

The public transport network requires greater equity in terms of service speed and reliability, and this will be best achieved through centralisation transport planning and operations. Many of the rail services are woefully underserved, poorly managed and overpriced (Thameslink is one particular service). London's development should not be put in the hands of Train Operating Companies with little motivation to adapt quickly to changing conditions. Transport for London should be granted control over all services, allowing the development of an integrated and current

transport plan. An extension of planning and operations should be considered as far as rail services from some key commuter belt towns, again in order to better plan and coordinate future development.

[Response 2]

There are several opportunities to increase the benefits and reduce the costs of CrossRail 2. First, multiple-platforms should be considered in all the stations at the core section. In busy metros, the number of trains per peak hour is decided by the dwell time of each train at each station. The dwell time is the time used for passengers getting on/off a train (and for some at-station operations, including safety check before door closure). The current standard platform configuration for Crossrail 1 and other metro lines is shown in Figure 1. With this configuration, if a train stops at a station, then next train cannot enter the platform. Although London Underground's Victoria line runs 34 trains per hour, this is exceptional and is possible because each carriage has 4 doors on one side and the destination of trains are the same (and thus little variance in terms of the number of boarding passengers). Because Crossrail 2 will have several branches and the passenger distribution between trains will not be even (and the number of doors per carriage per side would be two or three), with the standard station configuration, it could run only up to around 24 trains only. UCL has run a series of experiments to investigate whether or not it is possible to accommodate 50 boarding/alighting passengers when the proposed Thameslink runs 30 trains per hour (proposed maximum capacity), and the result was "No" (UCL, 2008).



Figure 1. Standard track/platform configuration at stations

To solve the problem, an answer would be multiple platform (Figure 2). With this configuration, while a train is still dwelling at Platform 1, the next train in the same direction can enter Platform 2. This would allow more trains to run on the same line and it is possible to run around up to around 34 trains per hour even if the dwell time is significantly longer than that of Victoria Line. It can be seen that the additional infrastructure is just an additional track on the outer side of the platform in each direction and this little difference in fact significantly improves operational capability. In addition, even when a passenger ill is taken from a train (which is one of the major reasons of train delay of London Underground), if there are two platforms, one platform is available for the next train, which can run without being delayed by the train with the passenger ill. This improves the resilience of the operation. By adding switches between platforms 2 and 3, trains can reverse in case of emergency and this also improves operational resilience. Some people may think this is an engineering issue, but it is important to take account of this at an early planning stage because Crossrail 1 or Thameslink did not consider this, and it is envisaged that they will suffer from long dwell time of trains in its core section, in particular St Pancras and Tottenham Court Road stations.

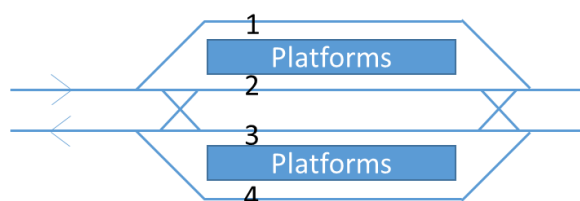


Figure 2. Suggested track/platform configuration at stations

Secondly, it is possible to consolidate depots around London. Currently, South Western Main Line has a depot at Clapham Junction and Wimbledon, and Great Anglia and West Anglia Line has one at Illford as a near-London rolling stock base. The reason of having a London depot is that London is a terminus of the line and operationally it is convenient to have a depot around a terminus. However, when Crossrail 2 opens and many trains run through London, there will be no strategic reason to have a depot in or near London where land prices are high. Depots can be consolidated and moved somewhere (and old depots in and around London can be sold).

[Response 3]

Crossrail 1 has been partly funded by business rate supplement. Yet, residential landlords are arguably the bigger beneficiaries of improved transport infrastructure in London. A similar council tax supplement will not only capture the residential land value lifted by Crossrail, but will also incentivize more efficient location choice by all of the Londoners.

3-3. What are the options for the funding, financing and delivery of large-scale transport infrastructure improvements in London, including Crossrail 2?

[Response 1]

In the UK, although a good portion of the rail fare revenue will be reinvested to infrastructure improvement, customers do not feel that their money will be used for improvement of their lines. In Japan, there is a law which enables each private train company to add a (relatively small amount of) surcharge to the fare, which will be used solely for a specific capacity improvement project. This arrangement looks similar to the current funding arrangement for Network Rail and Train Operating Companies in the first sight, but the differences are that 1) in Japan each main commuter line is owned by a different company and thus customers think that the surcharge is used only for the improvement of their particular line, and that 2) the surcharge can be added even before the project completes on the basis that current users will benefit in the future. This approach can be used in the UK as well. For example, as preparation for Crossrail 2, it may be possible to add a specific surcharge to the lines whose trains will run into Crossrail 2. The surcharge can be distinguishable from what the TOC would like to charge as the fare to them. Because people can expect that the money will be used for the specific project which is (or will be) beneficial to them, it would be easy for them to accept the surcharge.

In addition, before Games 2012, there was an increase of council tax in London to generate funding for Games-related constructions. This was accepted by the public because the increase of

the tax was for a limited period and Games 2012 were generally welcomed. This approach can be used for major transport projects which bring a wider economic benefit to communities.

Lastly, when contracting out the work, Crossrail 2 should consider consolidation of the infrastructure building and railway operation (i.e. running trains). Past major transport projects in London have seen separation of infrastructure building and railway operation, which is common in transport infrastructure development in developing countries. London Underground's Public Private Partnership scheme, which included infrastructure upgrade and operation, did not go well, but this was mainly down to their lack of experience in specification or contracts. Now London has learnt lessons, and the proposed combined approach could save money because in modern projects, much money and effort have to be spent on integration between different systems. By consolidation, it is possible to transfer the costs and risks associated with integration, to the contractor.

[Response 2]

Apart from the aforementioned value capture taxation approach, China has been experimenting with privately funded metro station maintenance by local homeowners who expect their property/land value to rise as a result of improved transport facilities.

4. References

- London School of Economics and Political Sciences (2007) The Impact of Recent Immigration on the London Economy, report downloadable from <http://www.lse.ac.uk/geographyAndEnvironment/research/london/pdf/theImpactofRecentImmigrationOnTheLondonEconomy.pdf>
- Marchetti C (1994): Anthropological Invariants in Travel Behavior, *Technological Forecasting and Social Change*, Vol. 47, pp75-88, Internal Publication, International Institute for Applied Systems Analysis, Laxenburg, Austria
- Metz D (2008) *The Limits to Travel: How Far Will You Go?* Earthscan, Abingdon (Oxon)
- Office for National Statistics (2014) Internal Migration by Local Authorities in England and Wales, Year Ending June 2013, downloadable from <http://www.ons.gov.uk/ons/rel/migration1/internal-migration-by-local-authorities-in-england-and-wales/year-ending-june-2013/sty-2---focus-on-london-moves.html>.
- University College London (2008) Investigation into Train Dwell Time, Research report submitted to Department for Transport
- University College London (2015) Social Infrastructure: Changing Demographics, report downloadable from http://issuu.com/ucl_cpm/docs/changing_demographics_151127
- Zahavi Y (1973) The TT-relationship: A unified approach to transportation planning, *Traffic Engineering and Control*, Vol. 15, pp205-212