

Infrastructure, policy, and Brexit

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Abstract: Infrastructure is affected in a variety of ways by Brexit. In some areas, such as aviation, rail, and energy, there are single market activities at various stages of maturity. In other areas, such as water and waste, regulatory standards have had considerable impact in the past and there are current directives in preparation. These regulations can now be rethought to suit British distinctiveness. Technological change and market developments also require changes in how economic regulation is done, which is an opportunity opened up by Brexit

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I. Introduction

Britain's infrastructure policies and plans do not at first sight refer much to the requirements of the EU. The National Infrastructure Plan, published in 2010,¹ focused on national needs as, indeed, does the rubric of the National Infrastructure Commission² and the Infrastructure and Projects Authority³ which were both established in 2015. The approach to Brexit negotiations in this area, as well as any potential outcomes, are therefore both unclear and potentially somewhat distant from more immediate considerations.

Nonetheless infrastructure requirements are at the forefront of economic policy. In the Chancellor's Autumn Statement, a number of spending announcements focused on infrastructure. The fund of £23 billion for productivity-related spending includes monies for improving transport—both road and rail—and extending and supporting digital infrastructures. Infrastructure provision is clearly seen as a necessary support to the economy in the run-up to actual Brexit and to raise productivity and economic growth.

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The opinions expressed here are those of the author and not those of the National Infrastructure Commission. I am grateful for comments from an anonymous reviewer.

¹ <https://www.gov.uk/government/publications/national-infrastructure-plan-october-2010>

² <https://www.gov.uk/government/organisations/national-infrastructure-commission/about>

³ <https://www.gov.uk/government/organisations/infrastructure-and-projects-authority/about>

This is an attitude that has been emerging for some time as the establishment of both the Commission and Authority illustrates. But in order to consider further how the Brexit challenge might affect infrastructure decisions or indeed constrain them, a definition is needed. A natural way of limiting the definition is to restrict it to structures which have a physical dimension. This allows us to capture roads, rails, and wires, as well as water supply and sewerage. As well as being networks, such structures also have the characteristic of long lives, outlasting most business valuation criteria and suggesting the potential for underinvestment (Helm and Mayer, 2016).

All of these come under the remit of the UK's National Infrastructure Commission (NIC). The built environment also has important elements of fixity, however, and provides nodes to the infrastructure network. Once a particular spatial distribution of activity is in place, it is hard to change and this in turn has implications for the supply of other infrastructure activities. On the other hand, it is possible to invest and reinvest in buildings of all types quite rapidly and at small scale.

Infrastructure in general has been subject to extensive policy, regulation, and government engagement from its inception: major roads originated as military assets, railways required Acts of Parliament, and pylons needed national planning. While the detail differs across sectors and is therefore affected differentially by both EU and national policy, there are some general themes. Environmental policy has been a major area of EU activity, and has had particular impact on energy (renewables and decarbonization) and waste (recycling, waste management). Energy and renewables are both also covered in more detail in the articles by Pollitt (2017) and Hepburn and Teytelboym (2017) in this issue. In what follows, some of these themes are drawn out, while some distinctions are also listed, although the coverage is by no means exhaustive.

II. Infrastructure decision-making

The UK has had a distinctive approach to economic infrastructure in recent years, dating back to the early 1990s and the push for privatization and cost efficiencies. Office for National Statistics (ONS) estimates show that about half the value of infrastructure assets is held in private hands (Grice, 2016). A regulatory system, which has been a successful export to other countries, including some of those of the EU, focused on establishing a value for the relevant sector's balance sheet—the RAB or regulated asset base—and combined this with an estimate of the weighted average cost of capital (WACC) to define a guaranteed return which could be expected by investors. It has been enormously successful in attracting investment funds which wanted such guaranteed returns ((Helm and Mayer, 2016). Water UK,⁴ for example, estimates that over £116 billion has been invested by private companies in England and Wales since privatization. The guaranteed return, of course, then sets the charges that operators can make to customers. This system applies to energy, telecoms, and water and sewerage companies, and to a limited extent in air and rail.

However, the weaknesses of this system are becoming increasingly apparent. In a stable and static economy it could be possible to create a framework which can maximize the benefits of any particular technology and where analysts can reasonably produce

⁴ <http://www.water.org.uk/policy/financing-industry>

an accurate estimate of both the asset values and capital costs. However, in a dynamic economy, or one with feedbacks between different elements of infrastructure, this is increasingly difficult.

New technologies and new policy aims will further undermine the framework, as will the existence of externalities. The NIC, in undertaking its National Infrastructure Assessment (NIA), must take all of these into account and in due course some of these may require a rethink of how the regulatory framework operates in the privatized infrastructure monopolies. The NIA, currently being scoped, is intended for publication in 2018 and so its development will overlap with the process of negotiation for leaving the EU.

There are several relevant examples of technological change. In the *Smart Power* report, published in March 2016, the NIC recommended a different treatment of battery storage systems provided by electricity generators (NIC, 2016a). This will support more renewable energy, but in the longer term produces a challenge to the national distribution system owned by National Grid, as such systems are likely to become less essential and less well used. This has implications for the valuation of this asset which our existing regulatory mechanisms will find it hard to cope with. Some of these implications have been reviewed by the EU. So far, the conclusion has been that these issues are largely within the purview of member states, although there might be a requirement for distribution system operators (delivering to final users) to work with transmission system operators (such as the National Grid in the UK).

More broadly, there are long-term relationships between electricity supply and electrification of transport, whether by rail or by road. Self-driving cars exist already in the sense of the capacity to avoid collision, but self-navigation requires greater bandwidth of broadband/wireless communication to enable full capacity driverless ability. All of these cross connections between technologies and infrastructures can be either facilitated or constrained by policy or by government spending as much or more than by consumer choice and business investment decision-making. In another example of feedback, electric cars will require a charging infrastructure and their batteries will themselves increase electrical storage capability (see [Copenhagen Economics and VVA Europe, 2016](#)).

To say that there are feedbacks is, however, much easier than specifying them in any detail, let alone managing them or planning for them. The current state of modelling of infrastructure need is very much from a given economic scenario via fixed parameters to infrastructure requirements. Incorporating a range of scenarios, the potential for feedbacks and uncertainties about technology is very much a focus of the development of an NIA. The uncertainties about the outcome of Brexit will be part of this but are likely to be overshadowed by major issues of technology disruption.

Indeed, it is hard to separate specific uncertainties about the outcome of Brexit negotiations from the more general uncertainties around the future of the economy and technology. In decision-making, regulation, and management, changes are needed above and beyond, but affected by, anything to do with Brexit. The EU issues that come to the fore most clearly as infrastructure plans are developed in the UK fall into three groups. These are:

- ownership and control;
- market structures and management;
- standards.

III. Ownership and control

(i) Private-sector control

The vast majority of UK infrastructure is owned and operated by corporations. Roads and railways are the exception not the rule and here too there are corporate structures within public ownership. Many of these corporations are foreign owned, or at least partially so. Many have invested because they see stable returns—and some would argue generous ones—in a clearly defined legal framework. A key challenge is to maintain such certainty over operating assets in an environment which was facing increasing uncertainty even before the Brexit vote.

Changing technology, climate change, and global conditions are all major sources of fundamental market pressures regardless of any institutional changes to market arrangements. Technology challenges have the potential to create major disruption. Energy production and distribution is one major change, massive increases in bandwidth and connectivity is a second, and machine learning techniques is a third. Each of these has great potential for disruption; taken together they are even more disruptive.

How business owners will react to these is an emerging and evolving matter. A lot will depend on how balance sheets are valued over the coming years. International accounting standards are changing and the new rules can affect the valuation of both financial and non-financial assets (EY, 2016). The rules, which were tightened in the wake of the financial crisis, require greater reductions of asset value to cope with risk and credit problems. They also require all leases to be put on to corporates' balance sheets.

Enabling the UK to identify and exploit the opportunities generated by economic change must be a key aim of both Brexit negotiations and economic policy more widely. New ownership models and new investment strategies could be enabled when there is less requirement to develop models suitable for all 27 different countries.

The ability to exploit balance sheets of different sizes is very relevant here. The public–private partnership (PPP) for the London Underground system was supposed to enable private-sector investment in modernizing the tube. It failed. The firms which took on these partnerships not only suffered from internal conflicts of interest, but did not have large enough balance sheets to manage the risk of such large and difficult projects on an operating railway.

On the other hand, companies with a focus not on the balance sheet but on profit and loss can be very effective in promoting users of a system and driving down costs. Getting the right horses for courses—which implies a dynamic solution—could be a source of competitive advantage for the UK if it were unconstrained by having to agree such structures on a wider basis. The right answer is, of course, currently unknown—and is unlikely to be a static one either. This is what we should be thinking about, as well as the continued willingness of foreign-owned companies to own and to invest in UK regulated assets.

(ii) Public-sector control

Government involvement in infrastructure industries has consequences for both borrowing and the balance sheet. European national accounting rules include criteria for

when a body's debt should count towards the government's debt and deficit. Changes in these rules meant that Network Rail came back on to the government's balance sheet in 2014. A combination of government control of management, government spending contributions, and debt guarantees came together to create this judgement. A similar judgement applied to Housing Associations.

The changes were propounded in the European System of National and Regional Accounts 2010 (ESA10) which replaced ESA95. The definitions of what constituted a government activity were tightened in this document in paragraphs 20.18 and 2.38 (Eurostat, 2013), but are interpreted by the national statistical offices. This looks like an accounting change, but has had dramatic consequences on how investment is decided, prioritized, and controlled. Network Rail, still valued for corporate purposes at around £50 billion—based on cash-flow potential—is valued at £380 billion in the books of the government, choosing a depreciated replacement-cost basis which includes an estimate of what it would cost to build the existing railway today from scratch. As well as adding to the balance sheet, the change of classification also adds to government borrowing of around £30 billion. Instead of being able to raise money on the international bond markets, both housing associations and Network Rail are now much more constrained and the interpretation of rules for what constitutes either debt or deficit have become very relevant.

Of course, ESA10 is interpreted by a national body—the ONS. A national system could have exactly the same rules and interpretation for what constitutes public control, debt, or deficit reduction. Transparency, clarity, and independence are important assets in this as in other systems. However, more local control at least has the potential to create a more transparent and simpler system than ESA10. For example, it has taken both time and much money (lawyers' fees) to determine whether the sale of a lease of railway property constituted either debt or deficit reduction. The rules are different and issues centred on how long a lease could run, right of access for inspection, and a wider variety of other questions, all to be interpreted by statisticians as guardians of a particular international system and with no appeal or recourse to other levels of national decision-making.

Another consequence of such rules is that financial investments are structured with more and more care. For example, the Thames Tideway tunnel, now under construction, has a financial mechanism by which government guarantees only kick in when particular risk parameters are breached. This has allowed it to be kept off the government balance sheet, as the guarantees do not cover all the borrowing, but only that required under specific circumstances and when things have gone sufficiently badly wrong.

These rules also have consequences for other sectors where policy and government finance or pricing control can be considered to give overall control. Rail rolling stock is one such, but so too are power stations and potentially other sectors with economic regulators. The new rules have so far also changed the treatment of government income from 3G and 4G auctions, for example, and the maintenance of the independence of the entities owning such assets could potentially also be called into question.

ESA10 is not enshrined in national legislation and therefore, post-Brexit, the UK could implement a different interpretation of the international system of accounts which would have consequences for the measurement of the size and constitution of the public sector, government debt, and government deficits.

IV. Market structures and management

The UK has pioneered the development of an integrated wholesale market for *energy*, as Pollitt (2017) describes in this issue. He also describes how this has had only limited benefits, in view of the importance of the international markets and the limited use of interconnection. The recent report from the NIC (2016) did recommend that there should be an increased focus on provision of interconnection. While this focused on countries with renewable production, such as Norway and Iceland who are not EU members, this development could nonetheless be affected or at the least delayed by the processes of Brexit. Pollitt also makes the point that the use of existing interconnectors could be affected and become more risky as a result of Brexit.

In *aviation*, the Single Aviation Market was set up in 1992, but has taken a number of years to get established. As the EU fact sheet coyly points out:

In order to ensure a level playing field, the legislation on State aid and competition (mergers, alliances, price-fixing, etc.) applies to the air transport sector. This was not obvious since major public recapitalizations of airlines were rather common until the mid-1990s.⁵

Indeed, although there are regulations on slot allocation, pricing transparency, and against discrimination, the vast majority of routes departing from EU airports are still served by only one or two carriers. National policy has maintained a grip on much of aviation.

For the UK, however, international air transport is particularly important, and Heathrow is the busiest international airport in the world. The 2007 Open Skies agreement between the EU and the US allows any airline of the European Union and any airline of the United States to fly between any point in the European Union and any point in the United States without additional regulatory approval. Loss of membership of such an agreement would have significant consequences for UK airlines.

The Open Skies agreements are about landing rights, but airspace management is equally important and has an international dimension. The UK's airspace management has not been overhauled since the 1960s, and the Single European Sky (SES) project is an EU initiative which would integrate UK air traffic management with the whole of the EU.⁶ The aim is to create 'functional airspace blocks'—the first one has been that for the UK and Ireland, set up in 2008. The SES project was launched in 1999 and is making slow progress. However, realignment of air traffic in northern Europe, in particular, is long overdue and slowing progress still further will potentially constrain air traffic growth in southern England.

The UK has a much more privately focused *domestic transport* system than most EU countries. The move to create Highways England was a partial separation of the highways strategic network maintenance and construction from the Department for Transport (DfT). Rolling stock is owned by special purpose vehicles (ROSCOs) which are essentially leasing companies, while train operating companies bid for franchises from the DfT. The rail infrastructure—which can be thought of as rather like National

⁵ http://www.europarl.europa.eu/atyourservice/en/displayFtu.html?ftuId=FTU_5.6.7.html

⁶ <http://www.nats.aero/about-us/ses/single-european-sky/>

Grid—is in the public sector but intended to be run as a separate company. This separation of function has been endorsed by the EU, which views this approach as appropriate. However, most other EU countries have not allowed much privatization and, indeed, many of the UK operating companies have European public-sector train companies either as joint-venture partners or directly as owners.

Brexit would make it possible to come up with a different split between infrastructure management and train operation. This would certainly enable a different market strategy with increased vertical integration, which is currently ruled out. This could in principle make possible vertically integrated private companies running both trains and infrastructure.

Digital infrastructure policy in the EU has been more about access and pricing than about the provision of the underlying wires or wireless systems. The Digital Single Market strategy is defined as: ‘to allow better access for consumers and business to online goods and services across Europe. This will remove the key differences between online and offline worlds, to break down barriers to cross-border online activity’.⁷ For the underlying infrastructure there has been continuing debate and difference of opinion between member states and in 2014 the proposed provisions to coordinate spectrum allocations was dropped, leaving the telecoms legislation concentrating on matters such as roaming pricing. As a result, member states are able to specify their own spectrum access arrangements and pricing and how market structures result. The UK can continue to run spectrum licence auctions, with complex bidding arrangements, as it sees fit. However, this is a matter that is likely to continue to generate EU debate and rules may change in the future, with unknown consequences either with or without Brexit.

Spectrum availability will be of increasing importance over the next few years as the debate about 5G and its rollout gathers pace. The NIC’s latest report, *Connected Future* (NIC, 2016b), recommended that investment was essential into connecting users of road and rail networks, alongside developing a universal service obligation. Both in the absence of an existing EU policy and with Brexit, these recommendations can be pushed forward.

V. Standards

Standard-setting has been a core part of EU decision-making over the decades and a central element of the attempts to create single markets. The creation of standards can be crucial to creating a market, as the story of the shipping container shows (Levinson, 2006). However, in many areas of infrastructure such standards are set as much by global bodies as by regional ones. The International Civil Aviation Organization, for example, sets standards and recommended practices to ensure safety and reliability of air travel and is a United Nations (UN) body. The International Electrotechnical Commission (IEC) sets standards for electrical products and systems, and the International Organization for Standardization a wider range of standards across

⁷ <https://ec.europa.eu/digital-single-market/node/78515>

numerous disciplines. These are not mandatory in the sense that an EU standard may be legislated, but often provide the backbone and research for comparability and use the language of directives. The International Telecommunications Union is another UN body which ‘allocates global radio spectrum and satellite orbits, develops the technical standards that ensure networks and technologies seamlessly interconnect, and strives to improve access to ICTs to underserved communities worldwide’.⁸

The UK is a full member of each of these organizations, all of which are central to future rules for aviation, telecoms, digital, and electric transportation rules both worldwide and in Europe. This will be central to ensuring compatibility of products and their infrastructures in the future. The UK will need to pay increasing attention to these institutions in the future.

EU standard-setting has had particular bite, however, in some particular areas of infrastructure. These are road, rail, and water, waste, and sewage.

(i) Road and rail

In *road* standard setting there is a continuing debate on the extent to which large vehicle standards should be harmonized, with some countries having higher weights than the UK. There is speculation that 60-tonne large goods vehicles (LGVs) could be permitted in the future, for which many UK roads would not be suitable. However, there is no evidence that this is likely, and the UK does need to be able to take approved international lorries—as indeed it currently does. Negotiations will no doubt shortly be kicking off on the standards to be applied to autonomous vehicles and the associated infrastructure systems that will be needed to support them. Both international organizations, such as the IEC, and EU organizations will no doubt be gearing up for this. The UK will need to be at the table.

In *rail*, standards on interoperability require that, in principle, the same trains should be able to run on all EU train systems. This has obvious benefits for manufacturers and implies cost reduction. The UK, however, finds it difficult to use such requirements for trains because of historically different permanent-way dimensions and station and bridge clearances. For example, the new Intercity Express Programme (IEP) train has been specifically designed by the DfT for the UK and is being built by Hitachi in a dedicated factory in Newton Aycliffe. It is unclear whether it will ever be wanted by any other countries. On the other hand, the new trains for High Speed 2 (HS2) and elsewhere are being procured to an international standard (although there are several of these).

Signalling systems have the same problem. The European Train Control System had been designed to improve interoperability, but few trains will ever run on the UK and EU systems since only the Channel Tunnel makes this possible. It is more about system acquisition and cost control. The current UK digital railway programme envisages a move to a more advanced system which has yet to be built. If successful it could be exported and this potential could be undermined by Brexit. However, the standards are not yet written, so it is not clear how big a risk this would be.

⁸ <https://www.itu.int/en/about/Pages/default.aspx>

A week before the referendum, a new European Union Agency for Railways was established, which has the intention of setting single safety certificates, pre-approving new signalling systems, and establishing a single European railway area. It is not at all clear how this development will or could affect the UK.

(ii) Water, waste, and sewage

Environmental standards have been driven by EU regulation for a fairly lengthy period. Standards for water purity, clean beaches, and so on have a long pedigree. The most recent development is the Circular Economy Directive, which is not yet agreed and is about recycling. Since it is not yet in force, it is not clear what will now be passed through into UK law. Most of the previous Directives are of course now enshrined in UK law and thus are not affected. This applies both to the Water Framework Directive and the Floods Directive. Both of these, however, require plans and standards to be set by national agencies and so implemented. It is clear that the Flood Directive, published in 2007,⁹ has not prevented major flooding events in a number of countries in the years since (see [Helm \(2017\)](#), in this issue, for a proposal for reforming flood management).

The standards are regulated by the Environment Agency, while water companies are regulated by Ofwat. As in many other regulated industries, there is a move to widen regulatory objectives from the original cost-cutting for customers to both quality and environmental objectives. Such moves are not really affected by Brexit, except to the extent that there is a change in the way in which standards are set and policed. It's worth noticing that EU standards have not been agreed for water security and those for water catchments are not always relevant to individual jurisdictions. The Danube passes through 14 countries—they all apply water standards differently, even though basic standards are set both by the EU and the World Health Organization ([Danube Water Program, 2015](#)). Nonetheless, different standards exist for specific pollutants in different countries.

Sewage and water management have had a higher profile since episodes of flooding in recent years and are locally managed. Debates on flood protection, and sewerage infrastructure, such as the Thames Tideway Tunnel now under construction, are driven by UK considerations. So too is the issue of water shortages—London only has supply for around 3 days as the infrastructure currently stands.

The water and wastewater industry is currently facing significant regulatory change. Unbundling of retail services for commercial customers, required by the Water Act of 2014, will generate structural change, while a move to total expenditure settlements will also drive different behaviours ([Priestley and Hough, 2016](#)).

The treatment of waste has been a long-standing concern and the original Waste Framework Directive was revised in 2008 to streamline waste legislation and add a number of additional categories. Other pieces of EU waste legislation have also had UK consequences, such as on waste shipment, packaging and its recycling, recovery of end-of-life vehicles, collection of electronic and electrical equipment, and battery recycling, among others. All of these have had implications for the structure and

⁹ Directive 2007/60/EC of the European Parliament and of the Council of 23 October 2007 on the assessment and management of flood risks (text with EEA relevance).

infrastructure of waste collection, management, and disposal. Landfill sites have been reduced in number and the material that can be added to them is much more limited, with higher charges. This has also changed the operation of the construction industry and its use of materials. The Circular Economy Directive is the latest step along this road and how the UK will engage in its provisions will have consequences for a large number of sectors and, indeed, households.

VI. Conclusion

A focus on infrastructure investment has been apparent in the UK—and indeed elsewhere—since well before the referendum. The National Infrastructure Commission was set up in 2015, but prior to this there have been National Infrastructure Plans and a variety of proposals to develop a better infrastructure basis to the economy.

This moves away from an approach to infrastructure regulation which centred on cost-cutting within an existing production frontier, to one which focuses on both developing new technologies and to investing to support jobs, growth, and housing. The Chancellor's autumn statement in 2016 announced additional funds in a number of areas, as well as an ambition to raise the proportion of GDP which is spent on such industries.

The EU has had, partly as the result of UK influence, its own approach to developing single markets and improving efficiency. Single markets have been proposed in energy, aviation, digital, rail, and freight use. However, progress has been mixed and slow. In many areas, national interests of various kinds alongside technical differences have made agreement hard or impossible to reach. Nonetheless, there are continuing pressures at EU level to try to make progress and this can affect pricing and market access. The devil will be in the detail.

On the standards side, the complexity of international regulatory bodies combines with the legislative powers of the EU and each sector will be different. Whether in new systems for rail signalling or in standards for driverless cars, there will be both EU and global developments with which the UK needs to be intimately involved. In most cases the UK was a founder member of international regulatory bodies and needs to maintain this status.

The UK largely invented the role of economic regulators for specific industries. As they have evolved over the last quarter-century their role has changed with the rise in importance of environmental concerns and the focus on infrastructure as a generator or facilitator of growth and productivity. Brexit offers the opportunity to rethink the political economy of how the UK's regulation of such sectors can develop to be fit for the twenty-first century.

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