HM TREASURY

Infrastructure UK

Strategy for national infrastructure

March 2010

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Foreword

Infrastructure forms the economic backbone of the UK. It is the fabric that defines us as a modern industrialised nation. The standard and resilience of infrastructure in the UK has a direct relationship to the growth and competitiveness of our economy, our quality of life and our ability to meet our climate change objectives and commitments. Approximately £150 billion has been invested in economic infrastructure in the UK over the last five years. Increased levels of investment will be required to renew and maintain existing infrastructure and meet the new challenge of setting our economy on a low-carbon trajectory.

Infrastructure UK was set up in December last year to help deliver that vision. It creates a new strategic focus in government across the full range of infrastructure sectors, raising the bar on how this investment is planned, prioritised, financed and delivered over the long term.

The case for action is clear. During a period of fiscal consolidation it is important we continue to invest in infrastructure to support the recovery and stimulate sustainable long-term growth. With new demands and the majority of our infrastructure being provided by the private sector we need to create the right market conditions and attract new sources of private investment. The proposals in this document mark a significant step forward in how we attract this investment with the announcement of plans for a new Green Investment Bank focussed on investing in major low-carbon infrastructure projects. It also sets out how we will develop long-term plans and priorities, and improve delivery on the ground.

This strategy is a first step towards providing a more integrated approach to infrastructure development across the five sectors and networks that directly contribute to economic growth (energy, transport, water, waste and communications).

Over coming months and years Infrastructure UK will work closely with government departments, devolved administrations, regulators, investors, companies and consumers to carry out and further develop this programme of action. It is intended that Infrastructure UK will follow a collaborative approach in developing the way forward for a more coordinated and coherent approach to creating the infrastructure that we need today, and ensuring we have the right building blocks in place to create a national infrastructure fit for future generations.

Lord Davies of Abersoch, Minister for Trade, Investment and Small Business

Paul Skinner, Chair of Infrastructure UK

24 March 2010

Executive summary

The capacity, quality and resilience of national infrastructure in the UK directly affects economic growth, competitiveness in the global economy, national security, the ability to meet climate change objectives, and the quality of life of everyone in the UK. It can be an important source of competitive advantage.

This strategy assesses the challenges facing the UK's infrastructure and sets out ways in which they should be addressed drawing on the 2009 report by the Council for Science and Technology. It covers the key sectors of economic infrastructure: energy, transport, water, waste and communications.

The 2009 Pre-Budget Report established Infrastructure UK as a focal point for the UK's infrastructure, responsible for developing a new strategic approach across infrastructure sectors. It will work with a wide range of stakeholders from the public and private sectors to bring about a step change in the way we plan, prioritise, finance and deliver infrastructure in the UK. To achieve this, Infrastructure UK has three key objectives:

- enabling long term investment;
- developing effective long term plans and priorities; and
- improving delivery.

In the last five years an estimated £150 billion has been invested in the economic infrastructure of the UK, predominantly by the private sector. The demand for investment in economic infrastructure in the UK is expected to be in the range of £40-50 billion per annum until 2030, and possibly beyond. This is significantly above historic levels.

This additional investment will be driven by new demands such as population growth and the need to cut greenhouse gas emissions and adapt to climate change. In particular, there needs to be a significant increase in investment in the energy sector and the use of new low-carbon technologies. The Government is committed to the development of a greener economy, as well as the creation of new jobs, skills and industries in the low-carbon infrastructure sectors.

This strategy sets out the following range of actions to tackle these challenges

Enabling long term investment

Infrastructure UK and other stakeholders have identified that there is a significant risk of a gap emerging in the provision of equity capital to large complex infrastructure projects within the next few years.

To bridge this gap, **the Government intends to establish a Green Investment Bank (GIB) that will operate on a commercial basis and will involve both public and private sector capital. The Government will start by investing up to £1 billion from the sale of mature infrastructure-related assets and would seek to match this with at least £1 billion of private sector investment – creating a fund of approximately £2 billion**.

The GIB will be mandated to invest in the low-carbon sector and will consider new energy and transport projects in particular, where the equity gap is likely to be most critical. Because of the timing of the investment decisions, it is likely that the GIB will focus initially on offshore wind

electricity generation. GIB will also consider the case for investing in other infrastructure as appropriate and as the need for investment arises.

Infrastructure UK will be responsible for managing the establishment of the GIB and will publish a consultation on its establishment in the summer. Infrastructure UK will also work with key stakeholders within government departments and the private sector to identify where changes in policies and regulation are required to encourage investment in infrastructure in the UK. Infrastructure UK will ensure that any proposed changes to the policy and the regulatory framework will be considered in terms of their potential impact on private sector investors and the availability of financing.

Developing effective long term plans and priorities

Decisions on relative priorities, and timing, of potential infrastructure developments will need to be made across both the public and private sectors. There is a need to ensure that investment is focussed on areas of greatest benefit, particularly those that best support long-term economic growth.

Infrastructure UK will develop a National Infrastructure Framework, alongside the process for the next Spending Review, so that effective decisions on prioritisation and timing can be made in the context of a long-term, cross-sectoral view of infrastructure needs.

The National Infrastructure Framework will be published by the end of 2010 and will contain:

- a vision of the qualities and role that the UK's infrastructure should aim to develop and sustain over the next 50 years;
- the outcomes the UK will seek through both public and private sector infrastructure development and investment over the next 10 years;
- a portfolio of potential public and private infrastructure investment that will deliver those outcomes; and
- the priority policy interventions for government that will take forward the necessary development of, and investment in, that portfolio.

The Government will consider whether and how to give longer-term certainty to public spending on infrastructure to support the aims of the National Infrastructure Framework.

Infrastructure UK will also work with the infrastructure industry, regulators, government departments, the Cabinet Office, and the Centre for the Protection of National Infrastructure **to identify the critical interdependencies that impact on infrastructure investment needs and will publish an action plan setting out the response to them by spring 2011.**

Improving delivery

It is important that infrastructure is delivered in an efficient and cost-effective way, comparable with international benchmarks. To improve delivery of infrastructure, and to support delivery of the outcomes of the National Infrastructure Framework, Infrastructure UK will:

- **commission an investigation into the cost of civil engineering works for major infrastructure projects in the UK**, building on existing evidence of potentially high costs for this in the UK compared with the rest of Europe, and will publish the conclusions and recommendations by the end of 2010;
- **work with government departments to develop and publish an Infrastructure Technology Strategy in 2011** that coordinates future investment in research,

development and innovation for infrastructure in line with the priorities set out in the National Infrastructure Framework. This will include consideration of the potential for infrastructure excellence clusters; and

- **publish alongside the National Infrastructure Framework a summary of relevant departmental supply chain analyses** for the sectors of infrastructure that they sponsor and outline any cross-cutting action that may be necessary.

This document

Chapter 1 considers UK infrastructure today, the way in which that infrastructure is currently funded and financed, and the future demand for investment in infrastructure.

Chapters 2, 3 and 4 then address Infrastructure UK's objectives:

- enabling long-term investment;
- developing effective long term plans and priorities; and
- improving delivery.

1 Infrastructure in the UK

This strategy covers the key economic infrastructure sectors: energy, transport, water, waste and communications.

The demand for infrastructure investment in the UK is expected to be in the range £40-50 billion per annum until 2030, and possibly beyond – significantly exceeding the recent historical average of approximately £30 billion per annum.

The majority of investment in economic infrastructure in the UK is already provided by the private sector and this additional investment will also need to be met primarily from private sector sources.

Additional investment will be driven by new demands such as population growth, investment in low-carbon technologies and adaptation to climate change. For example, in the energy sector, increased investment is required to meet the UK's targets for greenhouse gas reduction and increased use of renewable energy sources, demanding new infrastructure such as nuclear and offshore wind electricity generation.

Estimates suggest that demand for infrastructure investment could remain high until 2030, and possibly beyond.

The majority of empirical research indicates that there is a positive relationship between infrastructure investment and economic growth. However, there is likely to be increasing competition for resources, skills and capital as countries across the world face the need to invest in infrastructure to meet new challenges in a changing world. This presents the UK with both challenges and opportunities.

What is economic infrastructure?

1.1 Infrastructure networks enable people, goods, energy, information, water and waste to move efficiently around the UK and, in some cases, across its borders. The extent, capacity and quality of these networks has a direct bearing on the economy of the UK, the environment and the quality of life of everyone who lives in or visits the UK. This strategy covers the economic infrastructure sectors that include these networks. Table 1.A provides a broad definition of the main components of economic infrastructure.

1.2 While the focus of this document is economic infrastructure, it is recognised that there are strong interactions with other areas of investment (such as schools, hospitals and housing). There are mutual dependencies between these areas, and they may compete for finance from the same sources. Infrastructure UK will support HM Treasury in prioritising capital spending on infrastructure and will work with government departments to support the delivery of priority public projects and programmes.

Table 1.A: Economic infrastructure

Sector	Significant assets
Water	Water resources (rivers, reservoirs and dams), drinking water distribution (pipes and pumping stations), waste water treatment, sewerage systems, flood and coastal defences.
Waste	Landfill, recycling facilities, waste collection and processing, hazardous waste treatment, energy recovery.
Transport	Roads (strategic and local), heavy rail, light rail, airports, ports, metro systems.
Energy	Gas storage, transmission and distribution, electricity generation (renewable and non-renewable) transmission and distribution.[1]
Communications	Fixed voice and data networks, mobile voice and data networks, satellite networks, television and radio broadcast networks and radio spectrum.

1.3 Infrastructure UK will work closely with the Devolved Administrations in Northern Ireland, Scotland and Wales, recognising their particular and varying responsibilities. While some of the policies in this paper are specific to England, the challenges are common across the four countries of the United Kingdom. Each will need to consider the most appropriate arrangements in those areas for which they have devolved responsibility, to address the issues in ways that meet their own circumstances and needs.

Economic, environmental and social imperatives

1.4 Economic infrastructure drives competitiveness and supports economic growth by increasing private and public sector productivity, reducing business costs and diversifying means of production. This is evident at a national, regional and local level. The majority of empirical research indicates that there is a positive relationship[2] between infrastructure investment and economic growth.[3] For example, the recent commencement of the Dubai Ports World container port in the Thames Gateway supports UK supply chains and trade, while also bringing investment and growth to the local area. However, it is important that the benefits of infrastructure investment are weighed against the costs when making investment decisions.

1.5 Infrastructure networks are a major source of greenhouse gas emissions. Energy supply and road transport account for 39 per cent and 22 per cent of the UK's carbon dioxide emissions respectively. Landfill accounts for 41 per cent of methane emissions.[4] The UK's obligations and commitments to reducing greenhouse gas emissions are therefore dependent on substantial investment in new or adapted economic infrastructure and its associated technology.

1.6 Delivering social objectives, such as accessibility and affordability, can be an important driver of infrastructure policy. Economic infrastructure has an impact on quality of life for citizens and also contributes to broader economic welfare. It is therefore an important component of a place's economic context and underpins its growth prospects.

[1] For the purposes of this strategy, the definition of energy infrastructure includes facilities to store gas and generate electricity. Facilities to explore and extract gas (or fossil fuels used to generate electricity) are not included in this definition.

[2] The positive effects of infrastructure investment are conditional on the features of the broader economy and policy environment such as macroeconomic stability and the availability of other factors of production (e.g. skilled labour, capital).

[3] *Going for Growth*, OECD, 2009, highlights that investment in physical infrastructure increases long-term economic output more than other kinds of physical investment.

[4] 2008 figures, *UK Climate Change Sustainable Development Indicator: 2008 Greenhouse Gas Emissions, Final Figures*, Department of Energy and Climate Change, 2008

Funding and financing infrastructure in the UK

1.7 Any infrastructure has to be paid for over time, either by those who use it or by government – this is referred to as **funding.** Meeting the up-front costs of building infrastructure requires **financing.** Financing can be provided either by the private sector or from public sector sources. Private financing is only possible when there is confidence that the up-front investment will be repaid over time by the funding stream.

1.8 There are a number of alternative, and familiar, models for funding and financing UK economic infrastructure, as shown in Figure 1.A. This shows that funding and financing arrangements can vary greatly across sectors. Transport has a particularly complicated mix of models within its sub-sectors – for example, the rail industry has a unique mix of user-funding, public revenue support and private financing.

1.9 Economic regulation of privately-funded and financed infrastructure providers, for example in the airports, water and energy network sectors, has reduced the cost of capital by increasing certainty for investors that investment will be remunerated. Economic regulation has also driven operational efficiency, for example by the adoption of RPI-X regulatory regimes, thus benefiting consumers. Private finance has been attracted to these sectors and efficient investment decisions have been made.

Figure 1.A: Funding and financing models, with examples

			Energy	Telecoms	Transport	Waste	Water
Public capital	User funding	Public industry				commercial waste operations by Local Authorities	Scottish water
	Taxpayer funding	Conventional capital procurement			most roads	municipal waste facilities	flood and coastal defences
Private finance		PPP/ PFI			M25 widening	municipal waste treatment	Northern Ireland water PFIs
	User funding	Economically regulated private industry	National Grid	BT Openreach	some airports		England & Wales water supply and sewerage
		Other private industry	electricity generation	cable networks	ports	commercial waste disposal	

1.10 Meeting the demand for increased investment over the next decade will require an increase in private sector investment in UK economic infrastructure. Government may need to consider changes to the funding and financing models in some sectors.

Infrastructure in the UK

1.11 The UK has a successful and robust regime for delivering investment in infrastructure. Alongside public funding and financing of infrastructure, the UK has, since the 1980s, put in place market and regulatory arrangements that have secured substantial private sector infrastructure investment. By transferring discrete sectors to private ownership, and by emphasising the importance of competition in driving operational efficiency, the UK has

achieved significant investment in many of its infrastructure assets. This investment has been delivered while protecting consumers via independent and transparent economic regulation.

1.12 The current performance of the UK's infrastructure, as well as its preparedness to meet present and future challenges, varies across sectors. Annex B provides a high-level summary of each of the sectors in the UK. Some key challenges are identified below:

- water infrastructure requires ongoing maintenance and renewal to maintain service levels, meet environmental standards and ensure sustainability;
- meeting EU environmental targets (such as reduction of landfill use) requires reconfiguration of waste management infrastructure, which is underway;
- growing congestion in England is estimated to result in additional costs of £25 billion to the economy per annum by 2025 (compared with 2003) if demand is not met;[5]
- the energy sector requires increased investment - electricity generation capacity that is going offline needs to be replaced with new low-carbon generating stations (which are more capital intensive) and declining indigenous gas production increases demand for new gas import and storage facilities; and
- the roll-out of fibre-based next-generation broadband access to sparsely populated areas may not be economic for commercial providers; the Government has therefore announced that it will support the roll-out of next generation broadband with the Next Generation Fund.

International comparisons

1.13 Meaningful global benchmarking of infrastructure is difficult since national demands and circumstances vary widely.[6] However, *The World Economic Forum's Global Competitiveness Report (2009-2010)* ranks and scores the infrastructure of countries using a combination of survey and hard data.[7] The UK is ranked 20th out of the 133 countries covered and 6th out of the G8 economies. The UK's score for infrastructure is equal to the G8 mean.[8]

1.14 Approaches to infrastructure development vary considerably across countries. Box 1.A provides examples of actions taken by governments in several countries to coordinate infrastructure provision and development.

[5] *The Eddington Transport Study*, HM Treasury and Department for Transport, 2006

[6] Economic geography varies across countries. Furthermore, countries are at different stages in the lifecycle of both economic and infrastructure development.

[7] Infrastructure is one of the 12 pillars of competitiveness that the World Economic Forum (WEF) assesses in order to compile its Global Competitiveness Index. The infrastructure pillar is assessed by weighting eight indicators (which are based on either survey data from WEF's Executive Opinion Survey or hard data): quality of overall infrastructure, quality of roads, quality of railroad infrastructure, quality of port infrastructure, quality of air transport infrastructure, available seat kilometres, quality of electricity supply, telephone lines.

[8] UK receives a rating of 5.4 out of 7 for the infrastructure pillar.

Box 1.A: Approaches to national infrastructure in other countries

Australia

- The Department for Infrastructure, Transport, Regional Development and Local Development has cross-cutting responsibility for infrastructure.
- The Government of Australia established Infrastructure Australia in 2008 to take a new approach to national infrastructure planning, funding and implementation. Infrastructure Australia has developed a blueprint setting out national infrastructure priorities.
- In January 2009 the Government of Australia established a Building Australia Fund to finance capital investment in transport, communications, energy and water infrastructure.

France

- A cross-departmental agency for territorial development[9] develops and coordinates territorial strategies with local government in consultation with civil society and the private sector.
- The sustainable development department[10] has central responsibility for all economic infrastructure sectors apart from communications – its strategy is underpinned by a five-year development plan.
- Concepts such as 'grand projets' or 'projets d'intérêt général' are supported by legal and planning tools such as a national public debate commission.[11]

New Zealand

- A National Infrastructure Unit was established within the New Zealand Treasury in 2009 to provide an overview of national infrastructure priorities and cross-government coordination, planning and expertise.
- A *National Infrastructure Plan* will be released in 2010 to set out priorities and planned investment. It will be updated every three years.

Canada

- Infrastructure Canada was established within the Department for Transport, Infrastructure and Communities in 2002 to act as a focal point for the Government of Canada on infrastructure issues and programmes.
- The Government of Canada is delivering approximately C$33 billion of infrastructure investment in the period 2007-2014 through the *Building Canada Plan,* which is supported by a number of funds.

Investment in UK infrastructure – historical spend and future pipeline

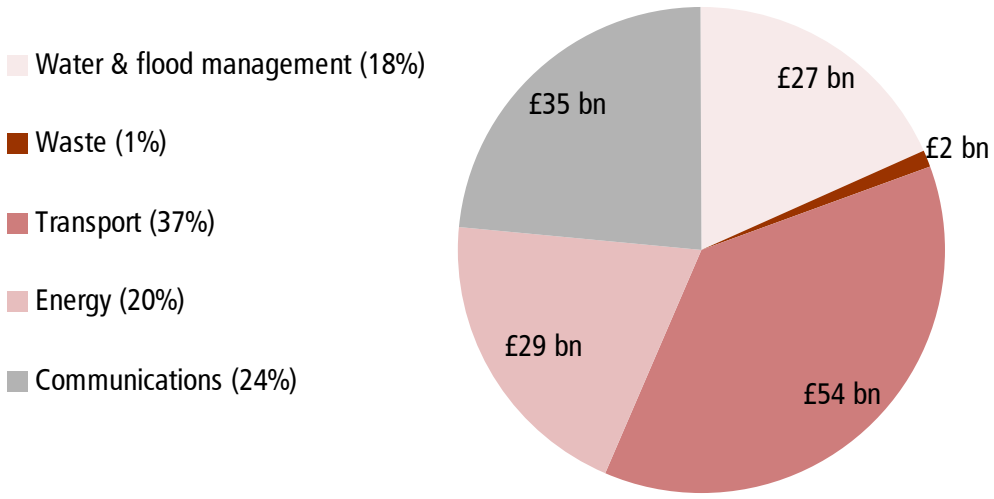
1.15 In the last five years an estimated £150 billion has been invested in the economic infrastructure of the UK. Chart 1.A shows the share of this investment in each of the five sectors. The majority of this investment was provided by the private sector as enabled, for example, by market and regulatory frameworks put in place by the Government.

[9] Délégation interministérielle à l'aménagement du territoire et à l'attractivité régionale known as DATAR

[10] Ministère de l'écologie, de l'énergie, du développement durable et de la mer

[11] Commission Nationale du Débat Public

Chart 1.A: Infrastructure investment 2005/06 – 2009/10 – circa £150 billion (2008/09 prices)

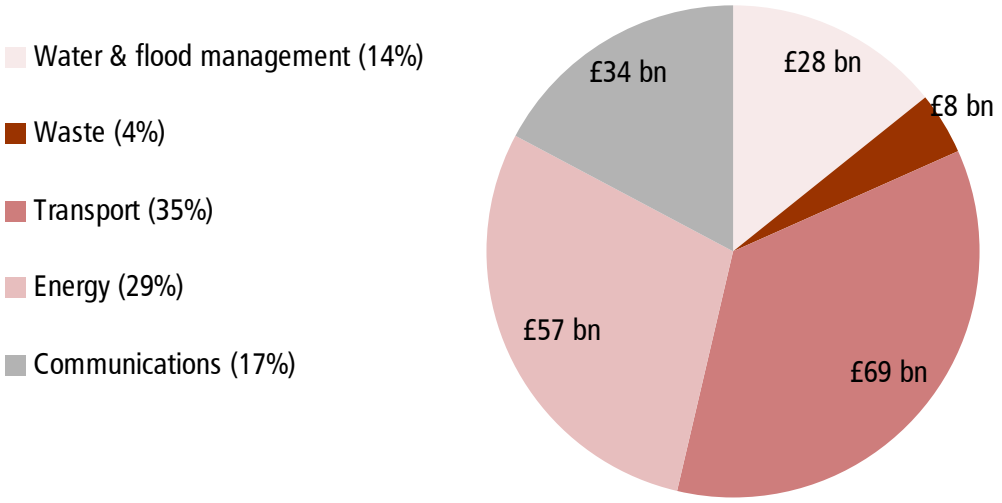


Source: Company accounts, regulators, Office for National Statistics, government departments and HM Treasury estimates

1.16 It is estimated that, over the next five years, approximately £195 billion of investment[12] in UK infrastructure is currently planned. This is based on aggregating individual planned investments that have been publicly declared in both the private and public sectors. The share of this planned investment across the five economic infrastructure sectors is shown in Chart 1.B. This estimate is in line with the Council for Science and Technology's estimate in its report *A National Infrastructure for the 21st Century*, June 2009, which estimated planned infrastructure investment in the UK at £200 billion in the period 2008-2015.

[12] A research exercise was carried out to identify planned investment over the next five years. This information was collected from publicly available sources including central government departments, other public bodies, regulators, the devolved administrations and private companies. It is important to note that the planned investment is only an indication and might be different from the actual spending allocations or outturn.

Chart 1.B: Planned infrastructure investment 2010/11 – 2014/15 - circa £195 billion (2008/09 prices)



Source: Companies' business plans, regulators, government departments and HM Treasury estimates.

1.17 It is particularly striking that planned investment in the energy sector is approximately double recent historical levels and that it will take an increasing share of the total investment in the UK's infrastructure.

The investment requirement

1.18 The investment pipeline described above reflects only planned investment that is relatively certain and visible now. Actual demand for investment is likely to be higher.

1.19 Factors such as population growth, cutting greenhouse gas emissions and adaptation to climate change are driving the need for increased investment in infrastructure. In some cases demand management measures (which may themselves require investment) are appropriate to mitigate the overall demands that these factors place on infrastructure.

1.20 Where this is not appropriate, or not consistent with economic growth objectives, an increase in infrastructure investment will be required. This could take the form of investment in the development of existing infrastructure or building new infrastructure. There will also be ongoing spending to maintain existing, and any new, infrastructure.

1.21 The Government has set legally binding targets to reduce greenhouse gas emissions by 34 per cent by 2020 and by at least 80 per cent by 2050 (from 1990 levels). The Government's lead scenario for delivering the renewable energy target indicates that around 30 per cent of electricity could be generated from renewable sources by 2020. Potential approaches to achieving the Government's 2050 climate change objectives will require electricity generation to be substantially decarbonised during the 2030s and despite energy efficiency improvements, electricity production will need to increase for transport and heat generation.

1.22 This will require fundamental changes in the technologies on which UK economic infrastructure is based. These changes have only just begun to be recognised in the investment pipeline. Some, such as offshore wind generation, are in the early stages of deployment. Others, such as the countrywide infrastructure that would be needed to support mass electrification of road vehicles, are more conceptual.

1.23 As discussed later in this strategy, these changes are significant not only for the amount of additional investment they require but also because they introduce new types of risk, particularly during the construction phase of projects.

1.24 The scale of the challenge has been presented in a number of public reports. For example, Ofgem Project Discovery[13] suggests a total investment by the energy sector of between £96 and £199 billion by 2020, whereas Ernst & Young[14] estimates the cumulative investment required to 2025 at £199 billion.[15] The Energy Market Assessment suggests the investment in the electricity sector alone to 2020 could be around £110-120 billion.[16]

1.25 In considering the scale of future investment demand it is therefore notable that:

- the recent historical trend rate for economic infrastructure investment in the UK is approximately £30 billion per annum;[17]
- the visible pipeline of planned investment for the next five years is equivalent to an average of approximately £39 billion per annum;[18]
- while the pipeline above includes approximately £11 billion per annum in the energy sector, the potential investment demand in the energy sector over the next decade has been estimated to be in the range £10-20 billion per annum; and
- applying OECD estimates[19] of demand for infrastructure investment as a percentage of GDP to the UK suggests that an average of around £50 billion per annum for the period 2015 – 2030 could be required.

1.26 Taking these different perspectives together, the demand for investment in economic infrastructure in the UK is expected to be in the range £40-50 billion per annum until 2030 and possibly beyond. This is significantly above historical levels.

1.27 The need to invest in infrastructure is not unique to the UK and presents a challenge to most economies across the world. There is therefore likely to be increasing competition for resources, skills and capital as countries around the world accelerate investment in infrastructure to meet new challenges in a changing world.

1.28 This anticipated increase in infrastructure development, both in the UK and globally presents an opportunity to drive economic growth in the UK at a national, regional and local level.

Rising to the challenge

1.29 This chapter has highlighted that there is a need for substantial infrastructure investment and development over the next few decades in order to address both sector-specific and common challenges. The following three chapters respond to the challenges that this raises in the context of Infrastructure UK's three objectives: enabling long-term investment, developing effective long-term plans and priorities, and improving delivery.

[13] *Slow Growth and Green Transition scenarios, Project Discovery*, Ofgem, October 2009. Note that the Slow Growth scenario does not achieve the 2020 renewables targets.

[14] *Securing the UK's energy future – seizing the investment opportunity*, Ernst & Young, July 2009

[15] Both Ernst & Young and Ofgem's estimates include the costs of new generation but also include investment in transmission and distribution, smart metering, domestic gas storage, LNG terminals and renewable heat.

[16] *Energy Market Assessment,* HM Treasury and Department of Energy and Climate Change, March 2010

[17] Derived from Chart 1.A

[18] Derived from Chart 1.B

[19] *Infrastructure to 2030: Telecom, Land Transport, Water and Electricity*, OECD, 2006. The OECD's estimate of demand for infrastructure as a percentage of GDP estimate excludes airports, ports, waste and flood management.

2 Enabling long-term investment

The investment challenge for UK infrastructure is driven by three main factors:

- an increase in the overall level of infrastructure investment required over the next decade and beyond;
- an acceleration in investment in certain types of infrastructure in the relatively near future, particularly those associated with a transition to a low-carbon economy; and
- a higher risk profile for certain types of infrastructure compared with historical norms, particularly in the area of low-carbon energy.

Where private industry is already able to address these challenges efficiently, government does not need to intervene, but where this is not the case, government has several ways in which it can influence the response from the private sector. It is also important to recognise finance cannot be considered in isolation. The availability of finance is related to the underlying regulatory and policy framework in the relevant market and changes to these will affect both the amount of finance and how it is delivered.

Infrastructure UK and other stakeholders have identified that there is a significant risk of a gap emerging in the provision of equity capital to large complex infrastructure projects within the next few years.

To bridge this gap, the Government intends to establish a Green Investment Bank (GIB) that will operate on a commercial basis and will involve both public and private sector capital. The Government will start by investing up to £1 billion from the sale of mature infrastructure-related assets and would seek to match this with at least £1 billion of private sector investment – creating a fund of approximately £2 billion.

The GIB will be mandated to invest in the low-carbon sector and will consider new energy and transport projects in particular, where the equity gap is likely to be most critical. Because of the timing of the investment decisions, it is likely that the GIB will focus initially on offshore wind electricity generation. The GIB will also consider the case for investing in other infrastructure as appropriate and as the need for investment arises.

Infrastructure UK will be responsible for managing the establishment of the GIB and will publish a consultation on its establishment in the summer.

Infrastructure UK will also work with key stakeholders within government departments and the private sector to identify where changes in policies and regulation are required to encourage investment in infrastructure in the UK. Infrastructure UK will ensure that any proposed changes to the policy and the regulatory framework will be considered in terms of their potential impact on private sector investors and the availability of financing.

The investment challenge

2.1 The investment challenge for UK infrastructure is driven by three main factors:

- an increase in the overall level of infrastructure investment required over the next decade and beyond;
- an acceleration in investment in certain types of infrastructure in the relatively near future, particularly those associated with a transition to a low-carbon economy; and
- a higher risk profile for certain types of infrastructure compared with historical norms, particularly in the area of low-carbon energy.

2.2 In a period of fiscal consolidation it will be important to create the necessary conditions for infrastructure development while minimising recourse to public funding. It will require the Government to decide where its own investment is most critical and can be most effective.

2.3 It is also important to recognise that finance cannot be considered in isolation. The availability of finance is related to the underlying regulatory and policy framework in the relevant market and changes to these will affect both the amount of finance and how it is delivered.

2.4 Where the circumstances are such that the private sector is already able to meet the challenges efficiently, government does not need to intervene, but where this is not the case, government has four main levers by which it can influence the response from the private sector:

- policies influencing the wider business environment in which the infrastructure companies operate in common with all businesses;
- policies governing the activities of infrastructure companies in a particular sector, including economic regulation;
- direct public (taxpayer) funding of infrastructure; and
- targeted financial interventions to address specific gaps in the infrastructure market.

2.5 These levers need to be considered in the context of their application to specific infrastructure sectors. It is essential to understand and respond to the dynamics of the sectors where investment is required and to ensure that the solutions to any challenges identified are relevant, tailored and sector-specific. Government will need to assess the effectiveness of its interventions over time.

2.6 Infrastructure UK will work with relevant government departments and the private sector to identify and address circumstances where changes are required to create the conditions necessary for investment in infrastructure in the UK. There are, however, instances in which market and regulatory changes alone will not fully address gaps or will only do so at unacceptable cost.

Market evidence

2.7 Infrastructure UK has discussed the investment challenges facing the infrastructure sector with government departments, businesses, financiers, academics and industry groups. Pooling these views and experiences provides the following view of the current state of the market for infrastructure investment.

2.8 As derived in Chapter 1, the demand for investment in economic infrastructure is expected to be £40-50 billion per annum until 2030,and possibly beyond, including substantial investment in energy and transport projects. The majority of investment in economic

infrastructure in the UK has been provided by the private sector and the additional investment will also need to be met principally by the private sector.

2.9 Low carbon investment has particular financing challenges. For example, the Energy Market Assessment estimates suggest total investment in the electricity sector of £110-120 billion by 2020.

2.10 In electricity generation, the scale of the investment to 2020 is significantly higher than current rates of investment being delivered and is a reflection of low-carbon generation having higher capital costs than conventional fossil fuel plants. Beyond 2020 the level of capital expenditure is likely to increase further. Because of the long lead times required to bring new facilities on line, to meet carbon reduction targets beyond 2020, investment decisions regarding new electricity generation will need to be made over the next few years.

2.11 The risks associated with the construction and development of low-carbon electricity generation are more challenging than those associated with fossil fuel electricity generation, and as such the Government has less confidence in the rate at which developers obtain the financing for these projects.

2.12 Historically, investment in large complex projects in the low-carbon generation market has typically been provided directly by utility companies using their own resources. These companies operate in multiple markets and will take a disciplined approach to their investment decisions. They will be concerned with satisfying the needs of their shareholders and maintaining strong credit ratings, and are therefore unlikely to accelerate materially the pace at which they raise new capital. Therefore, it is likely that, while they will continue to invest in UK infrastructure projects at levels that are consistent with historical norms, the increase in the pace of new required investment will result in a gap in available finance. This is likely to result in a requirement for additional sources of equity and other forms of risk capital to enter the sector.

2.13 It is expected that as the market becomes increasingly confident with the risks in the technology associated with the delivery of these new low-carbon energy projects, new forms of risk capital will enter the market, reducing constraints on the availability of finance over time.

2.14 Additionally, in some infrastructure sectors, there is evidence that private investors, developers and corporations have difficulty in recycling their capital investment once a project has completed the delivery phase, which consequently reduces the amount of equity capital being made available for new investment. More efficient recycling of capital is essential to ensure that there is sufficient equity capacity in the market.

2.15 There is a similar issue in the debt markets. Institutional long-term debt providers favour projects when they reach the operational phase, generating stable long-term cash-flows. There is a need to ensure that capital raised for the development stage can be recycled into the long-term capital markets. Infrastructure UK will continue to work with key stakeholders in conjunction with the ongoing market and policy reform work to address this issue, which exists across all major infrastructure markets.

Responding to the investment challenge

2.16 In the light of market evidence gathered by Infrastructure UK, the immediate response to the investment challenge needs to be focussed on two main areas:

- attracting diverse investment in respect of both geography and investor type, such as sovereign wealth funds, pension funds and insurance companies; and
- enabling increased investment in the delivery of large, complex projects through mitigating risks for investors through changes to policy and co-investment as a direct government financing intervention.

2.17 The most important means of encouraging investment is having the right regulatory and policy framework in place for infrastructure sectors. It is also essential that policy be seen as stable and effective. Infrastructure UK will play a key role in ensuring that any changes to the public policy framework are made in recognition of their potential impact on the investment choices made by the private sector and the availability of finance.

Green Investment Bank

2.18 Infrastructure UK has identified that there is a significant risk of a gap emerging in the provision of equity capital to large, complex projects in the low-carbon sector. To bridge this gap, the Government intends to establish a Green Investment Bank (GIB). The GIB will be mandated to invest in the low-carbon sector and will consider new energy and transport projects in particular, where the equity gap is likely to be most critical. Because of the timing of the investment decisions, it is likely that the GIB will focus initially on offshore wind electricity generation. The GIB will also consider the case for investing in other infrastructure as appropriate and as the need for investment arises.

2.19 The GIB will provide co-investment alongside utilities and other infrastructure sponsors to augment the capital that they are able to invest within the constraints they face. Additionally, by providing equity, and potentially other forms of risk capital, the GIB will have greater influence over the pace of investment in required infrastructure than would other forms of intervention.

2.20 The Government intends to start by making a capital contribution to the GIB by recycling up to £1 billion of proceeds from the sale of mature government-owned infrastructure-related assets that was announced in the 2009 Pre-Budget Report. The Government would seek to match this with at least £1 billion of private sector investment – creating a fund of approximately £2 billion. The GIB will operate on a commercial basis to attract, alongside the Government's contribution, a substantial amount of private sector investment from sovereign wealth funds and domestic and international pension funds and insurance companies.

2.21 The structure of the GIB will be developed in consultation with potential private sector investors to ensure the most effective leveraging of the government's contribution. The GIB's investments will be managed independently by investment professionals in accordance with criteria agreed with investors.

2.22 Infrastructure UK will publish a consultation on the establishment of the GIB in the summer. This consultation will provide further detail, and seek views on, how GIB might be structured and operate. Infrastructure UK will also consider the need for primary legislation.

2.23 Infrastructure UK will publish proposals on how to take forward the GIB at the 2010 Pre-Budget report. The final implementation of the GIB will be subject to market testing and the final value and timing of asset sales. Recognising the extent of the work required, Government anticipates that the GIB could be operational by autumn 2011. This timing accords with that of the projected need for investment.

Infrastructure UK's next steps

2.24 It is essential that the link between policy reform and enabling long-term investment, including the possibility of direct financing interventions, is maintained. Accordingly, Infrastructure UK will continue to advance the GIB over the coming months, and it will work with stakeholders in ensuring that policy and regulatory changes are effective in enabling long-term investment.

2.25 The Government remains of the view that it should continue to identify new sources of private sector capital for infrastructure and this is complementary to the development of the GIB. In particular, Infrastructure UK will continue to engage with institutional investors in the UK

and abroad to encourage these investors to be providers of long-term debt for infrastructure investments. The Government will also work to identify ways to mitigate financial risks to enable long-term debt providers to access infrastructure projects.

2.26 The Government will continue to work closely with the European Investment Bank, which has been a key participant in the infrastructure debt market, playing a particularly critical role over the last two years.

3 Developing effective long-term plans and priorities

Delivering the planned investment in infrastructure, particularly in a period of fiscal consolidation and economic recovery, will be challenging. Decisions on the relative priorities, and timing, of potential infrastructure developments will need to be made across both the public and private sectors. There is a need to ensure that investment is focussed on areas of greatest benefit, particularly those that best support long-term economic growth. Any government interventions will also have to be focussed on areas where they can be most effective.

In response to this challenge, Infrastructure UK will develop a National Infrastructure Framework, alongside the process for the next Spending Review, so that effective decisions on prioritisation and timing can be made in the context of a long-term, cross-sectoral view of infrastructure needs.

The National Infrastructure Framework will contain:

- a vision of the qualities and role that the UK's infrastructure should aim to develop and sustain over the next 50 years;
- the outcomes the UK will seek through both public and private sector infrastructure development and investment over the next 10 years;
- a portfolio of potential public and private infrastructure investment that will deliver those outcomes; and
- the priority policy interventions for government that will take forward the necessary development of, and investment in, that portfolio.

The Government will consider whether and how to give longer-term certainty to public spending on infrastructure to support the aims of the National Infrastructure Framework.

Infrastructure UK will work with the infrastructure industry, regulators, government departments, the Cabinet Office, and the Centre for the Protection of National Infrastructure to identify the critical interdependencies that impact on infrastructure investment needs and will publish an action plan setting out the response to them by spring 2011.

Taking a long-term view

3.1 Most infrastructure assets have long economic lives, high development costs and require a long-term view to be taken of utilisation and return on investment. For example, building a new nuclear power station typically takes approximately four years for pre-development (including planning) and five years for construction, and is expected to last for up to 60 years. Such development can bring an upfront economic stimulus, and may result in sustainable employment and economic benefits to an area.

3.2 Taking a long-term view involves reconciling the benefits that infrastructure may generate over many years with the costs incurred in the shorter term. The Stern Review,[1] for example, set out the economic case for taking early action to mitigate the impacts of climate change – specifically, the trade-off between a high likelihood of very high costs of adaptation in the future and a lower cost of taking action now.

3.3 Infrastructure appraisals across the public and private sectors sometimes lack the framework necessary to articulate long-term benefits. This can mean that short-term projects with modest but clearly measurable benefits may be repeatedly prioritised over much longer-term projects, which may have greater transformational potential but are more difficult to evaluate.

3.4 Taking a long-term view also means reducing uncertainty and the type of stop-start planning that can result from focusing too much on a succession of short-term priorities. This undermines investor confidence and disrupts the supply-chain, leading to increased costs of infrastructure development. KPMG's September 2009 report[2] highlights short-term planning horizons and policy instability as key issues for government effectiveness.

3.5 However, this challenge cannot be dealt with by creating a one-off 50-year plan. As Box 3.A illustrates, it is very difficult to predict future demands and technologies and long-term frameworks need to be periodically refreshed.

Box 3.A: Infrastructure from the 1950s to 2010

When the Queen opened the world's first commercial nuclear power station at Calder Hall in 1956, the Lord Privy Seal, RA Butler, said, "It may be that after 1965 every new power station being built will be an atomic power station." By 2008, nuclear power still accounted for only 13 per cent of the electricity generated in the UK, while gas power stations have become the largest source of electricity.

The modem was invented in 1958 for military applications and could transfer data between two telephones at 110 bits per second. In 2009, UK consumers received an average broadband speed of 4.1 megabits per second, more that 37,000 times the speed of the first modems.

In 1959 it was possible for the first time to make a direct-dial long distance call from a telephone box. By 2009, there were more mobile telephones than people in the UK.

The hovercraft, at the time a revolutionary new mode of transport, first crossed the English Channel in 1959. In 2007, with cross-channel hovercraft no longer operating, the Queen officially opened High Speed 1 to link St. Pancras International with the Channel Tunnel.

Taking a cross-sectoral view

3.6 Taking a cross-sectoral view means evaluating the choices for infrastructure across and between sectors rather than on a sector-by-sector basis. Given the scale of the future investment, it will become increasingly important to prioritise plans, and make any necessary trade-offs, across, between and within sectors. Questions that need to be addressed in the context of a long-term infrastructure framework might be, for example:

[1] *Stern Review: The Economics of Climate Change*, HM Treasury and Cabinet Office, October 2006
[2] *The Changing Face of Infrastructure: Frontlines Views from Private Sector Infrastructure Providers*, KPMG LLP, September 2009

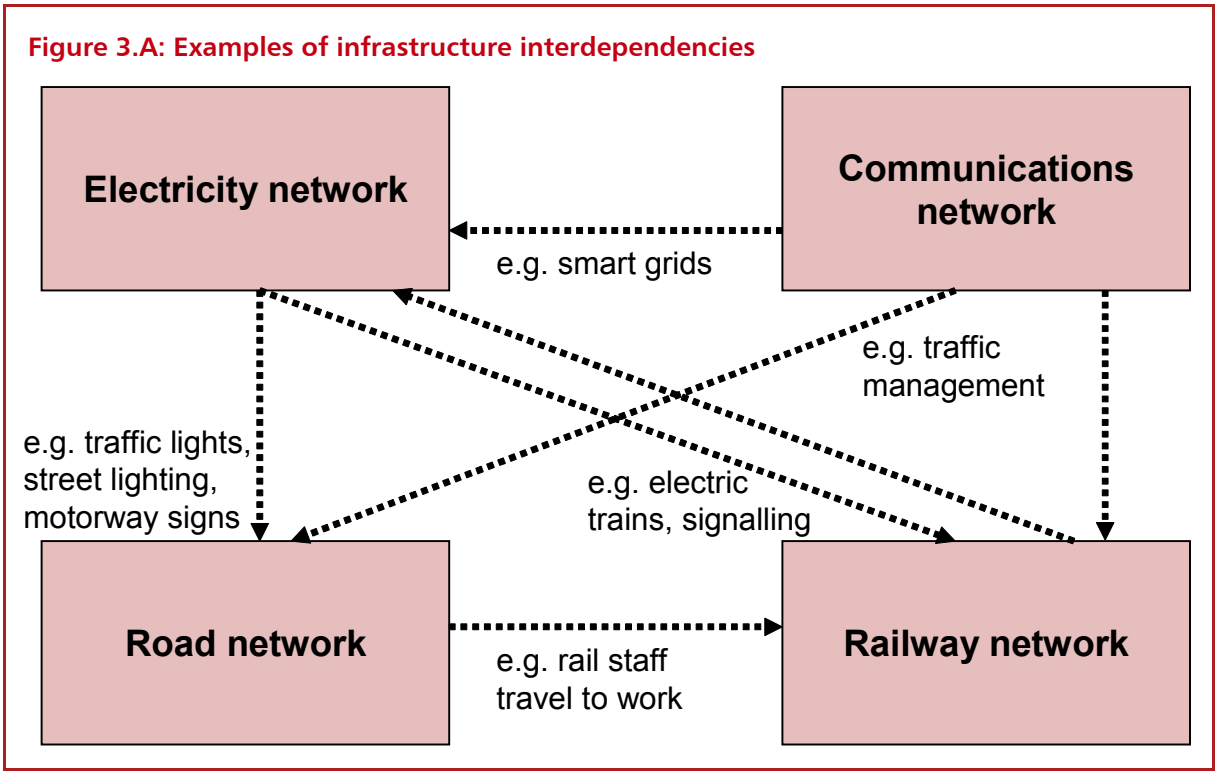
- Across sectors – What is the most effective balance between taxpayer funding and user funding, and between public spending and private sector investment, across the infrastructure sectors?
- Between sectors – What additional investment may be required in low-carbon electricity generation if there is to be increased electrification and decarbonisation of transport?
- Within sectors – What are the right modes of transport to meet changing demand in different parts of the country?

3.7 There is an increasingly critical interdependency between infrastructure sectors and networks, which affects the overall resilience of the national infrastructure. Physical co-location of assets can lead to shared risks of failure – for example, as a result of flooding. New technologies are embedding new network interdependencies – for example, smart grids and smart metering in energy mean that energy distribution will increasingly depend on communications networks.

3.8 There will be trade-offs across sectors between the higher costs for government or users of increased resilience, and the possible costs of failure if investment in resilience is insufficient. In order to make these trade-offs, the methodology for valuing the benefits of resilience needs to improve.

3.9 Figure 3.A illustrates some further examples of resilience dependencies and the potential for knock-on failure between sectors and places.

Figure 3.A: Examples of infrastructure interdependencies



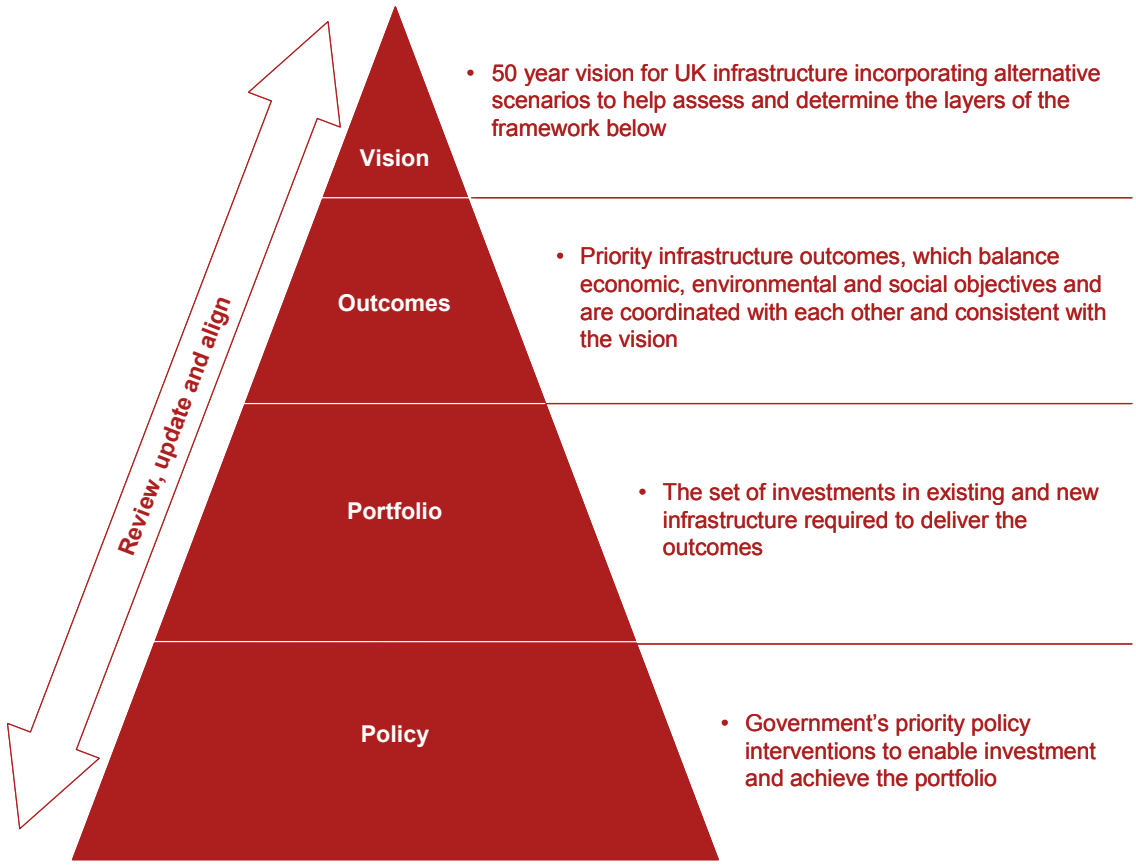
National Infrastructure Framework

3.10 Infrastructure UK will develop a National Infrastructure Framework, alongside the process for the next Spending Review, to enable effective prioritisation and timing decisions to be made with a long-term, cross-sectoral view of infrastructure needs.

3.11 As illustrated in Figure 3.B, the National Infrastructure Framework will contain:

- a vision of the qualities and role that the UK's infrastructure should aim to develop and sustain over the next 50 years;
- the outcomes the UK will seek through both public and private sector infrastructure development and investment over the next 10 years;
- a portfolio of potential public and private infrastructure investment that will deliver those outcomes; and
- the priority policy interventions for government that will take forward the necessary development of and investment in that portfolio.

Figure 3.B: The National Infrastructure Framework



3.12 Infrastructure UK will develop the National Infrastructure Framework progressively, working with stakeholders across the public and private sectors. The first edition of the National Infrastructure Framework will be published by the end of 2010 and Infrastructure UK will subsequently monitor and periodically update it.

3.13 The framework will be used to inform public spending priorities and will help to deliver the commitment in the 2009 Pre-Budget Report to focus investment on the areas where it generates high economic returns. Aligning the different layers of the framework will provide increased stability and transparency for infrastructure developers, financers, operators and consumers. Any expenditure implications as a result of Infrastructure UK's proposals would be agreed with, and once agreed be the responsibility of, the spending Departments affected, who will continue to be accountable for policy in the areas in which they lead.

3.14 Infrastructure UK will not be directly responsible for delivering the infrastructure projects – that will be done by the private sector infrastructure providers and investors, or the relevant government departments and agencies and regional, local and devolved administrations.

3.15 However, Infrastructure UK will be a focal point for the UK's infrastructure strategy. It will work with those organisations to define a coordinated and achievable set of outcomes, and will support government departments in policy design and connecting departmental strategies and objectives (and, for example, National Policy Statements). Infrastructure UK will also be available to support those departments on the delivery of priority infrastructure projects. For example, Infrastructure UK is already supporting the Department for Transport on the High Speed Two project and the Department for Business, Innovation and Skills on next generation broadband.

3.16 To ensure consistency, Infrastructure UK is proposing six cross-sectoral principles for infrastructure (Box 3.B), which will guide the choices that will be made in creating the National Infrastructure Framework.

Box 3.B: Proposed principles for the National Infrastructure Framework

Infrastructure projects or policies should be considered and appraised in terms of:

1. their long-term costs and benefits, including their expected effect on infrastructure outcomes for the next 10 years and their consistency with the 50 year vision, in particular their contribution to the transition to a low-carbon economy;
2. their choice of funding and finance models and their efficiency and effectiveness compared with alternative models;
3. the options for demand management and more effective utilisation of existing or renewed assets, as alternatives to major investment in new assets;
4. the potential synergies and interdependencies with other infrastructure;
5. their impact on the overall resilience of infrastructure networks; and
6. any significant impact on the supply chain, particularly innovation and new business opportunities.

3.17 These principles are in draft form and will be developed further for the framework. When agreed they will form supplementary guidance to The Green Book (HM Treasury guidance for government departments on appraisal and evaluation of projects and policies). This supplementary guidance will be applied to public infrastructure investment decisions and interventions to deliver the outcomes in the framework. It will complement the Government's basic principles such as value for money, affordability, and not causing unnecessary impacts on businesses, taxpayers and users.

Interdependencies and resilience

3.18 Increasing interdependencies across infrastructure networks may require particular investment across one or more infrastructure sectors. In its June 2009 report, the Council for Science and Technology recommended that a better understanding of interdependencies be developed.

3.19 Within government the relevant lead departments are responsible for the resilience of national infrastructure. They are supported by other cross-sector programmes, for example:

- the Centre for the Protection of National Infrastructure (CPNI) work on the protection of critical national infrastructure from security threats;
- the Cabinet Office work on improving the resilience of critical infrastructure and essential services to disruption from natural hazards; and

- the Defra programme for adapting to climate change, including the Climate Change Risk Assessment.

3.20 These interdependencies need to be taken into account in investment decisions in order to reduce the risk that a failure in one network has unplanned consequences elsewhere. This will require consideration of how resilience can be better valued in investment decisions.

3.21 Infrastructure UK will lead a review, working with the infrastructure industry, regulators, the Cabinet Office, other government departments and CPNI to identify the critical interdependencies that impact on infrastructure investment needs and will publish an action plan setting out the response to them by spring 2011.

Reforming investment and spending on infrastructure

3.22 The National Infrastructure Framework will be used to support public spending decisions at future Spending Reviews. There is therefore an opportunity to reform how government invests in, and spends on, infrastructure to support the overall aims and the long-term, cross-sectoral perspective of the framework. Through the National Infrastructure Framework, investors should have greater visibility of government plans and greater confidence in making their own plans.

3.23 In order to provide greater certainty in public funding, the Government introduced three-year spending allocations in the 1998 Spending Review. In some areas of publicly funded infrastructure delivery, further certainty has been created. For example:

- Private Finance Initiative (PFI) and other Public Private Partnership (PPP) approaches typically secure payments for 25-30 years through contractual structures;
- Network Rail receives a five year regulatory funding settlement; and
- the Renewables Obligation commits subsidy for renewable energy generation over 20 years.

3.24 The Government will consider whether and how to give longer-term certainty to public spending on infrastructure. Longer-term certainty can, however, reduce flexibility, and the Government will need to retain sufficient flexibility to balance and update its full range of spending priorities other than infrastructure as fiscal and economic circumstances change. Box 3.C sets out some of the issues that the Government will consider.

3.25 To support a cross-sectoral view, the Government will also consider whether and how pooled budgets for certain areas of infrastructure spending might encourage better coordinated Infrastructure investment.

Box 3.C: Consideration of longer-term certainty regarding infrastructure spending plans

- What is the right balance between certainty and flexibility to direct spending to the priorities of the present and the future?
- Are there examples where the time horizon of existing spending plans has hindered efficient and effective delivery of infrastructure or the UK's ability to attract investment?
- Does continued commitment to renewal and maintenance of existing networks need to be treated differently from investment in major new infrastructure?
- What has been the experience in areas where longer-term certainty has been provided through budgetary commitments, contracts or regulation?
- In which specific areas would longer-term funding certainty have the most impact, and what might the benefits be?
- Which types of certainty are most appropriate for specific areas of public infrastructure spending – for example, longer budgets, contractual structures or regulatory frameworks?

4 Improving delivery

As well as being clear about what infrastructure is needed and ensuring that appropriate funding and finance is available it is important that infrastructure is delivered in an efficient and cost-effective way, comparable with international benchmarks. Effective delivery can also bring business opportunities for the UK. If there are barriers to this, value for money from investments in infrastructure will be harder to obtain, and the burden on taxpayers and consumers will be unnecessarily increased.

To improve delivery of infrastructure, and to support delivery of the outcomes of the National Infrastructure Framework, Infrastructure UK will:

- commission an investigation into the cost of civil engineering works for major infrastructure projects in the UK, building on existing evidence of potentially high costs for this in the UK compared with the rest of Europe, and publish the conclusions and recommendations by the end of 2010;
- work with government departments to develop and publish an Infrastructure Technology Strategy in 2011 that coordinates future investment in research, development and innovation for infrastructure in line with the priorities set out in the National Infrastructure Framework. This will include consideration of the potential for infrastructure excellence clusters; and
- publish alongside the National Infrastructure Framework a summary of relevant departmental supply chain analyses for the sectors of infrastructure that they sponsor and outline any cross-cutting action that may be necessary.

Relative cost of infrastructure delivery in the UK

4.1 Many stakeholders have suggested that delivering infrastructure in the UK is expensive in comparison with other developed economies. There is some general evidence that may support this. A review commissioned by the Secretary of State for Business, Innovation and Skills on productivity and skills in the engineering construction sector found evidence that the productivity of engineering construction projects in the UK was very variable – up to 30 per cent better or worse than the average.[1] In addition, the latest study by the European Commission on construction price levels ranked the UK the fifth highest of the 27 Member States.[2]

4.2 High Speed Two (HS2) Limited's recent publication on the proposal for a new high speed rail line from London to the West Midlands identified some initial, more specific evidence that may support this finding. Benchmarking of the costs of major, comparable high speed rail line projects across Europe found that the UK unit rates for civil engineering works (for example, tunnels and viaducts) could be up to double those in Europe.

[1] *Changing to Compete: Review of Productivity and Skills in UK Engineering Construction*, Mark Gibson, December 2009
[2] *Wide Spread in Construction Prices Across Europe in 2007*, Eurostat, December 2008

4.3 High Speed Two (HS2) Limited considered a number of factors that might cause this, including that it may be an indication of a wider issue in the building and overall delivery of civil engineering works for major infrastructure projects.[3] For major infrastructure projects even a small difference in cost could achieve substantial savings for government, the infrastructure industry, and users of infrastructure.

4.4 The Government will therefore undertake an investigation into the cost of delivering major infrastructure projects in the UK. Infrastructure UK will commission the investigation, and will set up a steering group with the Government's Chief Construction Adviser, Paul Morrell, the Department for Business, Innovation and Skills, the Office of Government Commerce, the Department for Transport, and other relevant stakeholders.

4.5 The investigation will focus on factors that may lead to conclusions and recommendations for specific action that might reduce the cost of civil engineering works for major infrastructure projects. The Government will publish the conclusions and recommendations from this investigation by the end of 2010, and emerging findings will be published in the autumn.

4.6 As announced in the *High Speed Rail Command Paper,*[4] Infrastructure UK will also work with the Department for Transport and High Speed Two (HS2) Limited to consider how savings might be achieved for the proposed high speed rail line from London to the West Midlands.

Maximising business opportunities for the UK

4.7 As well as supporting long-term economic growth and business success, significant investment in new infrastructure also presents new economic opportunities for UK based businesses involved in the design, delivery, operations and maintenance of infrastructure. Opportunities may exist throughout the supply chain, ranging from research into new technologies and materials to the design of new commercial products and their installation and operation. Furthermore, through developing expertise in these areas, businesses based in the UK become better placed to compete internationally and exploit comparative advantages.

4.8 In April 2009 the Government set out in *New Industry, New Jobs* the case for an active government policy that seeks to raise industrial capability and drive growth.[5] Government can support businesses competing for infrastructure opportunities by developing a better understanding of the supply chains that support UK infrastructure, their capability, the business environment they operate in and the impact of government interventions upon them.

4.9 The *UK Low Carbon Industrial Strategy*, for example, is providing the framework to ensure that companies based in the UK are equipped to compete successfully for the new demand created by the transition to a low-carbon economy.[6]

4.10 Infrastructure UK will work with government departments and infrastructure providers to identify areas where UK capability could be improved, including opportunities for developing new markets, with the aim of establishing the UK as a centre of excellence in the delivery of infrastructure.

Encouraging infrastructure innovation and research

4.11 Targeted research, development and innovation can provide new technologies and processes to help meet some of the major challenges of delivering future infrastructure, such as the move to a low-carbon economy. Technology risk and uncertainty significantly affects the

[3] *HS2 Cost & Risk Model*, High Speed Two, March 2010
[4] *High Speed Rail Command Paper,* Department for Transport, March 2010
[5] *New Industry, New Jobs,* HM Government, April 2009
[6] *The UK Low Carbon Industrial Strategy*, Department of Energy and Climate Change and Department for Business, Innovation and Skills, July 2009

cost of finance. Public investment can help to reduce these risks for new infrastructure and can speed up deployment by enabling more rapid testing and commercialisation of technology. This investment must manage the risk that not all technologies that receive support will be commercially viable. Public investment must also stimulate and support privately funded research and development, without crowding out private investment.

4.12 Government provides support for a wide range of research and development, and innovation activities. This ranges from research at universities through to commercialisation of new products and technologies and the speeding up of deployment.

4.13 This support is provided through a wide range of delivery bodies including the Technology Strategy Board, the Research Councils, Regional Development Agencies and the Carbon Trust.

4.14 The funding landscape offers specialised support throughout the innovation chain. However, there is a risk it may be difficult for those seeking funding to identify where it may be available from.[7] The need for substantial investment in the UK's infrastructure, and the development of the National Infrastructure Framework, presents a new challenge. Opportunities for targeted and cost-effective support for research, development, deployment and innovation to deliver cost-effective infrastructure will need to be identified and pursued in a coordinated manner. This will require basic research input and provide potential opportunities for businesses in the UK.

4.15 Infrastructure UK will work with government departments and other partners to develop and publish an Infrastructure Technology Strategy that delivers a coordinated approach to future investment in research and development and innovation for infrastructure and will:

- identify opportunities to support government priorities for infrastructure set out in the National Infrastructure Framework;
- consider the role of privately funded infrastructure-related research and development and how this can be encouraged;
- consider implications for inward investment and export opportunities on the basis of UK research strengths and business capabilities; and
- use established coordination and engagement mechanisms where they exist, for example working through the Low Carbon Innovation Group, the Department of Energy and Climate Change and through the existing consultation mechanisms of the Research Councils and Technology Strategy Board.

4.16 As part of the Infrastructure Technology Strategy, Infrastructure UK will consider, with government departments, encouraging the establishment of infrastructure excellence clusters. This will build on existing market development bringing together research and innovation with the manufacturing, engineering and services businesses that will commercialise infrastructure technologies and projects. Where these clusters build on existing comparative advantages they can be very successful and economically important for the UK, for example the development of North Sea oil and gas resulted in a cluster of expertise in and around Aberdeen. However, it should be recognised that improving skills and developing supply chains can take time.

4.17 In the energy sector, Infrastructure UK will work with the Department for Business, Innovation and Skills and the Department of Energy and Climate Change to ensure consistency with the network of Low Carbon Economic Areas. These are designed to maximise the potential of the existing geographic and industrial assets of regions across the UK to build industry hubs, for example carbon capture and storage in Yorkshire and Humberside.

[7] *Renewable electricity-generation technologies*, Innovation, Universities and Skills Committee, House of Commons, June 2008

4.18 The Government will publish the first Infrastructure Technology Strategy in 2011.

Enabling delivery through the supply chain

4.19 Robust and reliable supply chains will be needed to deliver the infrastructure investment required over the coming decades in an effective and efficient way. It is therefore important that government takes into account the potential impact on the supply chain of its policy decisions.

4.20 This is particularly important for infrastructure as supply chains are often highly specialised and internationally mobile. For example, the requirements to deliver an offshore wind farm include: machinery to deploy; specialist engineering and construction expertise to build foundations, install and connect the turbines; and specialist ships to support the construction process.

4.21 The importance of infrastructure for the economy, and the level of private-sector provision means that effective engagement with business is essential. The Department for Business, Innovation and Skills will shortly be publishing principles for business engagement to support this. This will include a toolkit for government departments on conducting supply chain analysis, as well as the outcome of pilots used to test this approach, building on the interim report published in December 2009.[8]

4.22 The Government is already taking action to address supply chain needs in some key areas of infrastructure investment such as new nuclear power, renewable energy and low emission vehicles. A key part of this work is that skills needs are identified and addressed in good time. The UK Commission on Employment and Skills published their skills audit in March 2010 outlining skills needs that have been identified across the economy both immediately and in the longer term.[9] For example, a National Skills Academy for the nuclear industry has been set up by the sector with the support of government.

4.23 Infrastructure UK will publish a summary of departmental supply chain analysis for the sectors of infrastructure they sponsor. This will:

- set out progress examining supply chains for major areas of infrastructure to date and actions being taken to address any issues that have been identified;
- establish a programme of further supply chain analyses in light of the needs and vision identified in the National Infrastructure Framework; and
- provide the basis for government to consider what further action might be necessary to deliver the vision set out in the National Infrastructure Framework (see Chapter 3) and to realise wider economic benefits and opportunities associated with infrastructure development.

[8] *Thinking Business in Policy: an interim report*, Department for Business, Innovation and Skills, December 2009

[9] *Skills for Jobs: Today and Tomorrow - The National Strategic Skills Audit for England* 2010, UK Commission for Employment and Skills, March 2010

A Infrastructure UK

A.1 Infrastructure UK was established following the 2009 Pre-Budget Report to advise the Government on the long-term infrastructure needs of the UK. Infrastructure UK is a unit within HM Treasury and has consolidated within it a number of policy, financing, and delivery bodies. These included The Infrastructure Finance Unit (TIFU), HM Treasury's PPP policy team, and the capabilities within Partnerships UK (PUK) that support the delivery of major projects and programmes.

A.2 Infrastructure UK committed to an initial work programme, announced in the 2009 Pre-Budget Report, which includes:

1 developing this strategy for the UK's infrastructure;

2 making recommendations to stimulate increased private sector investment in infrastructure;

3 supporting HM Treasury in prioritising the Government's investment in infrastructure; and

4 actively supporting the delivery of major infrastructure projects and programmes and helping to build stronger infrastructure delivery capability across government.

A.3 Any expenditure implications as a result of Infrastructure UK's proposals would be agreed with, and once agreed be the responsibility of, the spending Departments affected, who will continue to be accountable for policy in the areas in which they lead.

A.4 Infrastructure UK has already provided support to the Department of Energy and Climate Change to support work on the *Energy Market Assessment*, to the Department for Business, Innovation and Skills on delivering the commitments of *Digital Britain*, and to the Department for Transport on the Government's response to a new high-speed rail line.

A.5 Infrastructure UK brings a new coordinated approach to infrastructure development and this is reflected in the collaborative way in which Infrastructure UK conducts itself, principally in its governance arrangements. Lord Davies of Abersoch, Minister for Trade, Investment and Small Business, is responsible for Infrastructure UK and reports to the Chancellor on this portfolio. Paul Skinner is the Chair of Infrastructure UK, and James Stewart is the Chief Executive. Together, they provide overall leadership for Infrastructure UK's activities.

A.6 An advisory council has been established to provide guidance on the strategic direction and work priorities of Infrastructure UK. The Advisory Council meet every quarter and their first meeting was on 24 February 2010. In addition to Paul Skinner, the Advisory Council is currently composed of the following members:

- Chris Bolt, PPP Arbiter, Office of the PPP Arbiter;
- Robert Devereux, Permanent Secretary, Department for Transport;
- Simon Fraser, Permanent Secretary, Department for Business, Innovation and Skills;

- Dame Helen Ghosh, Permanent Secretary, Department for Environment, Food & Rural Affairs;
- Terry Hill, Chair of the Transport Market, Arup Group;
- Cressida Hogg, Managing Partner, 3i Investments plc;
- Steve Holliday, Chief Executive, National Grid;
- Peter Housden, Permanent Secretary, Department of Communities and Local Government;
- Nick Mabey, Founding Director and Chief Executive, E3G;
- Sir Nicholas Macpherson, Permanent Secretary, HM Treasury;
- John McDonough, Chief Executive, Carillion plc;
- Moira Wallace, Permanent Secretary, Department of Energy and Climate Change; and
- Sir Mark Walport, Director, Wellcome Trust.

A.7 Infrastructure UK would be pleased to receive views on issues raised and proposals made in this document via e-mail: infrastructureuk@hm-treasury.gov.uk

B Summary of economic infrastructure sectors

B.1 Water and sewerage

Structure	• Industry in England and Wales was privatised in 1989. • Regional monopolies provide water and sewerage, or water-only services. • Independently regulated by Ofwat which sets challenging efficiency targets and limits on user charges and determines the cost of future capital over a five yearly price review period. • Companies have invested more than £85 billion[1] in water and sewerage infrastructure since privatisation – this has lead to major improvements in both water and environmental quality. • Flood and coastal defences mainly funded by central government.
Capacity utilisation	• Average domestic water use in England is an average of 150 litres per person per day.[2] • Stress on supply in the South and East where rainfall is comparatively low and consumption higher than average.
Prices	• Average combined water and sewerage bill is estimated to be £344 in 2009-10 in England and Wales. There are regional variations – bills in the South West are on average 43 per cent higher than in other areas.[1] • Prices have risen 42 per cent in real terms since privatisation[1] but are broadly in line with other countries.[3] • Approximately one third of households in England pay for water and sewerage services on the basis of metering, with most paying on the basis of the rateable value of their property.[1]
Efficiency and reliability	• A quarter of all water supplied is lost through leakage – about three quarters of this occurs during distribution and a quarter from customers' supply pipes. For most companies, the cost of reducing leakages exceeds the cost of producing additional water to compensate.[2] • 23 unplanned interruptions per 1000 properties per annum.[4]
Quality	• Drinking water quality is high in the UK – 99.96 per cent of water quality checks in 2006 met standards.[2]
Resilience	• 24 properties flooded per 100,000 properties per annum.[4] • 5.2 million properties at risk of flooding from rivers, the sea and surface water.[5] • The 2007 floods cost the economy £3.2 billion – £186 million of costs were associated with damage to water and sewerage infrastructure and disruption of services.[6]
Major challenges	• Rising demand and increased pressure on supply in the South and East due to climate change causing drier summers, decreased river flows and less predictable supply. • Maintenance and renewal of ageing network infrastructure (59 per cent of planned investment in 2010-2015 is to maintain capital)[7] combined with need to meet EU environmental standards. • Increasing need for expenditure on flood defence infrastructure – estimated that investment in England will need to double in real terms between 2010 and 2035 to maintain risk at current levels.[5] • Water companies are expected to adopt a twin-track strategy of demand management

[1] *The Independent Review of Charging for Household Water and Sewerage Services: Final Report,* Defra, December 2009

[2] *Future Water: The Government's Water Strategy for England*, Defra, February 2008

[3] *International comparison of water and sewerage service 2008 report*, Ofwat, 2008

[4] 2006-07 figures, Ofwat

[5] *Investing for the future: flood and coastal risk management in England - a long-term investment strategy*, Environment Agency, 2009

[6] *Delivering benefits through evidence: the costs of the summer 2007 floods in England*, Defra and Environment Agency, 2010

	and investing in new infrastructure.
Major projects in the pipeline	• Ofwat's final charges for 2010-2015 allow for £22 billion to be invested in the next five years.[7] • Thames Tideway tunnel waste water scheme (circa £2.5 billion). • Environment Agency planned capital expenditure of £1.1 billion on new and improved flood defences between 2008-09 and 2010-11.

B.2 Waste

Structure	• Waste management infrastructure is owned by local authorities, the private sector and the third sector. • Local authorities are responsible for the collection and disposal of municipal waste including the construction of required infrastructure, either through capital procurement or contracted-out services. Municipal waste accounts for 9 per cent of waste.[8] • The private sector is responsible for management of the waste it produces. Commercial and industrial waste accounts for 24 per cent of waste and construction and demolition, mining and quarrying account for 62 per cent of waste.[8] • EU directives (such as the EU Waste Framework Directive and EU Landfill Directive) provide an overarching legislative framework for transport, collection, disposal and recovery of waste.
Capacity utilisation	• Facilities in England and Wales managed around 150 million tonnes of waste in 2008: landfill 56.7 million tonnes; transfer facilities 46.8 million tonnes; treatment facilities 27.8 million tonnes; metal recycling 12.9 million tonnes; and incineration 5.2 million tonnes.[9] • Since 2000, remaining landfill capacity has decreased by 14 per cent.[9] • It is likely that climate change mitigation will lead to increased use of treatment rather than landfill.
Prices	• Local authorities pay for the costs of municipal waste collection and disposal services using council tax and a central government grant. • Households contribute to the costs of municipal waste collection and disposal services through their council tax.
Efficiency	• In 2007, the UK recycled 34 per cent of municipal solid waste, landfilled 57 per cent and incinerated 9 per cent. In comparison, the EU as a whole recycled 39 per cent of municipal solid waste, landfilled 42 per cent and incinerated 20 per cent.[10]
Quality	• Local authorities must adhere to the waste hierarchy and evaluate carbon consequences of potential technologies as part of their value for money calculations. This drives behaviour towards adoption of more energy efficient technology such as combined heat and power.
Major challenges	• Meeting environmental targets requires reconfiguration of waste management infrastructure – for example, more facilities to recycle and recover energy from waste are needed to divert waste from landfill. Many of these are already in the pipeline. • Mitigating climate change by moving up the waste hierarchy. • Waste infrastructure has to be procured, constructed and operated in a difficult planning and social environment as waste treatment facilities tend to be controversial. More needs to be done to address public concerns about the impact of these facilities and to publicise their wider benefits.
Major projects in the pipeline	• Government has so far awarded £2.6 billion of PFI credits to local authorities for 38 projects (representing a total capital investment of £6.4 billion by 2020) to enable the installation of the infrastructure required to meet EU and national environmental targets.

[7] *Future water and sewerage charges 2010-2015 final determinations*, Ofwat, 2009

[8] 2004 figures, Defra

[9] *Waste Information*, Environment Agency, 2008

[10] 2007 figures, Eurostat

B.3 Transport

Structure	• There is a mixture of government and private sector involvement in the local transport and rail sub-sectors.[11] Airports and ports are largely privately owned[12] and operated on a commercial basis. Roads are primarily publicly owned.[13] • Over the last ten years, the Government has invested over £150 billion in transport networks. • Government has also created an environment for significant private investment, such as Heathrow's Terminal 5.
Capacity utilisation	• At most times, trains operate below capacity but this changes in peak periods – the majority of lines into London are significantly above capacity during the morning peak period.[14] • Heathrow and Gatwick are operating at 99 per cent capacity[15] compared with Paris (Charles de Gaulle) operating at 80 per cent and Frankfurt operating at 73 per cent capacity.[16]
Prices	• Most of the road network is publicly funded and users generally do not pay at the point of use. Congestion charges have been introduced by local authorities in some urban areas (e.g. London), and there are a few cases where private companies have concessions and can charge users (e.g. M6 Toll Road). • Approximately half of all rail tickets, including season tickets, are regulated and average price increases are currently capped each year at RPI + 1 per cent. • Average air fare prices have fallen dramatically since 1997 – in 1997 prices, the average one-way airfare for an international flight has fallen from £215 in 1997 to £93 in 2008 and the average one-way fare for a domestic flight has fallen from £148 to £96 over the same period.[17]
Reliability	• 89 per cent of lost time on roads is estimated to be on urban roads. Over 90 per cent of traffic outside urban areas travels in relatively non-congested conditions. During peak periods, over 50 per cent of travel time in urban areas is at less than 20mph. Road congestion leads to high levels of emissions.[14] • One in ten trains in the UK arrive over 5 minutes late.[18] • Average delay per flight departing from / arriving at Heathrow is 11.9 / 11 minutes and Gatwick is 13.3 / 14 minutes compared with 12.3 / 9.4 minutes for Paris (Charles de Gaulle) and 10.1 / 10 minutes for Frankfurt.[19]
Quality	• Compared with other EU countries, a high percentage of the UK's urban population is within one hour of the strategic road network, airports and ports.[14] In 2006, the UK had 1,719km of road per 1000 square km compared with 1,749km in France and 1,805km in Germany. The UK has low levels of road deaths (4.3 per 100,000 population per annum in 2008) compared with other countries.[20] • The UK had 66km of rail network per 1000 square km in 2006 compared with 54km in France and 96km in Germany.[20]
Resilience	• Extreme weather conditions, such as snow, have an impact on transport networks. • 2007 floods resulted in £225 million of costs to the economy associated with damage to rail and road infrastructure and passenger delays.[6]
Major challenges	• *The Eddington Transport Study* estimated that increasing congestion in England would result in an additional £25 billion of costs to the economy per annum by 2025 (compared with the costs of congestion in 2003) if demand is not met. It has been estimated that in urban areas the impacts of transport associated with congestion,

[11] Network Rail (a private non-profit organisation) is the monopoly owner and operator of the railways network and stations and receives a government grant. Private train operating companies pay Network Rail access fees to operate franchised passenger services (and may either receive a subsidy from or pay the government a premium). Rolling stock is owned by private leasing companies.

[12] There are some public interests in the aviation market (e.g. some regional airports are owned by local authorities). 65 per cent of ports are privately owned, about a quarter are independent trust ports and 10 per cent are owned by local authorities.

[13] The Highways Agency owns and operates trunk roads and local authorities own and operate local roads.

[14] *The Eddington Transport Study*, HM Treasury and Department for Transport, 2006

[15] Figures from Department for Transport aviation forecasting model

[16] *Economic Benefits of Heathrow*, BAA, 2007

[17] Department for Transport analysis based on CAA passenger survey and ONS international passenger data

[18] Network Rail, February 2010

[19] *Annual 2009 Digest – Delays to air transport in* Europe, Eurocontrol CODA, March 2010

[20] *Great Britain Transport Statistics*, Department for Transport, November 2009

	poor air quality, accidents and physical inactivity impose costs of around £10 billion every year.[21] • The need to reduce greenhouse gas emissions presents a major challenge for the transport sector – this sector currently accounts for 21 per cent of the UK's greenhouse gas emissions.[22]
Major projects in the pipeline	• Crossrail (£16 billion). • Thameslink Programme (£2.9 billion). • M25 widening (£1 billion). • London Gateway Port (£1.5-£2.3 billion).

B.4 Energy

Structure	• The electricity industry in England and Wales was privatised in 1990-1991 and New Electricity Trading Arrangements were introduced in 2001. • Wholesale and retail markets are competitive. Network companies that own transmission and distribution networks are regulated monopolies. • Ofgem regulates the electricity generation and gas markets – five yearly price reviews affect the level of investment in networks. • Government has taken action to help the UK make the transition to a low-carbon economy.[23]
Capacity utilisation	• 83.5 gigawatts of electricity generating capacity (plus capacity to receive 2.5 gigawatts from abroad). Peak demand in winter is 60 gigawatts. Currently, 30 large (>1 gigawatt) power stations meet the majority of electricity demand. Significant capacity is due to come offline in the next decade – 11 gigawatts of coal and oil plants will close by 2015 and 7 gigawatts of nuclear plants will reach end of operating life by 2018.[24] • The UK's North Sea gas supplies are declining and it is increasingly dependent on imported sources to meet winter demand. Major commercial investments have delivered a 500 per cent increase in import capacity over the last decade from a diverse range of sources: new pipelines from Norway, interconnectors with Europe and Liquified Natural Gas (LNG) import terminals. Gas import capacity is around 125 per cent of annual consumption.[25] • The UK has 4.9 billion cubic metres storage capacity (existing and under construction), which corresponds to 5 per cent of national demand. Planning consent has been granted for facilities that would increase storage capacity to around 10 per cent of national demand.[26]
Prices	• In 2008, average UK domestic electricity prices (including taxes) were the seventh lowest in the EU15 and third highest in the G7, and were 2.7 per cent above the EU15 and G7 median.[27] • Between 1998 and 2008, domestic and industrial electricity prices rose by 36 per cent and 59 per cent respectively in real terms.[28] • In 2008, average UK domestic gas prices (including taxes where not refunded) were the second lowest in the EU15, third lowest in the G7, and were 19.4 per cent lower than the EU15 and G7 median.[27] • Between 1998 and 2008, domestic gas and industrial prices rose by 77 per cent and 191 per cent respectively in real terms.[28]
Reliability	• 99.9997 – 99.9999 per cent reliability of electricity national grid.[29] • On average, a gas customer suffers an un-planned interruption to supply once every 247 years with an average duration of 13.1 hours.[30]

[21] *The wider costs of transport in English urban areas*, Cabinet Office, 2009

[22] *UK Climate Change Sustainable Development Indicator: 2008 Greenhouse Gas Emissions, Final Figures*, Department of Energy and Climate Change, 2008

[23] Since 2002 the Government has supported the generation of electricity from renewables through the Renewables Obligation.

[24] Beyond the middle of the next decade, further closures will be driven by the proposed Industrial Emissions (Integrated Pollution Prevention and Control) Directive.

[25] *Digest of UK Energy Statistics*, Department of Energy and Climate Change, 2009; *Gas Transportation Ten Year Statement*, National Grid, 2009

[26] *Gas Transportation Ten Year Statement*, National Grid, 2009

[27] 2008 figures, *Quarterly energy prices*, Department of Energy and Climate Change, December 2009

[28] *UK Energy Sector Indicators*, Department of Energy and Climate Change, 2009

[29] *Securing Britain's Energy Supply Fact Sheet*, Ofgem, 2006

[30] Ofgem

Resilience	• The 2007 floods resulted in economic costs of £138 million associated with the electricity sector – over 90 per cent of this cost was associated with disruption of supply and around £9 million was due to infrastructure damage. For the most part the electricity supply system remained intact during the flood events and supplies were maintained by switching power distribution through different parts of the network, where possible. There were two major power cuts due to curtailment of supplies in Yorkshire and Lincolnshire, and the failure of a substation in Gloucestershire.[6] • Gas market performed strongly in January 2010 when faced by record demand (465 million cubic metres on 8 January) combined with four disruptions in supply. The market responded well to "Gas Balancing Alerts" from National Grid and met demand without large increases in wholesale prices (households and small business are unlikely to see an impact on their bills as gas retailers tend to buy their gas in advance on forward markets). Although the market had sufficient gas, supply interruptions to some industrial customers were made (under contracts which provided discounted prices in return for interruptability) due to constraints in some local distribution pipelines.
Major challenges	• The UK needs to replace considerable energy generation capacity that it going offline in the next decade and beyond. Government is confident that the current system will continue to deliver secure supplies of energy over the next decade. However, in the 2020s an increasing problem will be the increasing share of intermittent (wind) and inflexible (nuclear) plant on the system, which could create difficulties in balancing the system, affecting the economics of back-up flexible plant, such as gas-fired power stations. • Declining indigenous gas production will mean that, even with expected falls in gas demand due to climate change policies, having sufficient import and storage capacity will be increasingly important. • A major challenge over the next few decades will be the decarbonisation of the power sector – to achieve the UK's renewable energy and carbon 2020 targets, it is expected that electricity will be come approximately 30 per cent from renewables and 40 per cent from all low-carbon sources. • Investment is needed to make the electricity grid bigger and smarter – for example, sources of renewable electricity generation need to be connected to the grid and investment is needed to support new technologies.
Major projects in the pipeline	• Aggregate contracted power station capacity reveals an overall net increase of 26.2 gigawatts over the period from 2009-10 winter peak to 2015-16 winter peak.[31] As part of round three of the offshore wind programme, 32 gigawatts of electricity generating capacity could potentially be built in UK territorial waters.[32] • Projects under construction will increase gas import capacity by 17.5 billion cubic metres per year and storage capacity by around 0.6 billion cubic metres.[26] • Ofgem price control announcements allow £5.1 billion to be invested in electricity and gas transmission networks in 2007–12,[33] £5.3 billion in gas distribution networks in 2008–13[34] and £6.5 billion in electricity distribution networks in 2010-15.[35]

[31] *Seven Year Statement,* National Grid, 2009

[32] *The UK Offshore Wind Report*, The Crown Estate, 2010

[33] *Transmission Price Control Review: Final Proposals*, Ofgem, December 2006

[34] *Gas Distribution Price Control Review: Final Proposals,* Ofgem, December 2007

[35] *Electricity Distribution Price Control Review: Final Proposals – Allowed Revenue – Cost Assessment*, Ofgem, December 2009

B.5 Communications

Structure	• The communications sector is fully privatised but remains subject to regulation by Ofcom. • Openreach, part of BT Group, owns the majority of the fixed copper network. Virgin Media provides network competition to BT for around 50 per cent of households and market regulation ensures that there is vigorous competition at the retail and wholesale level across the market. • BT and Virgin Media are investing in next-generation fibre-based networks. Some regional and local network investments are also underway. • Significant competition in the mobile market – there are five major network operators and additional competition is provided by mobile virtual network operators. • Over the last decade, companies have made considerable investment to upgrade networks in response to constantly evolving technologies, consumer demands and expectations – for example, there has been significant investment to provide broadband over the existing copper network and also to provide mobile services.
Coverage and penetration	• Availability of services in the UK: fixed line – 100 per cent of population; 2G mobile - 98 per cent of population; 3G mobile – 87 per cent of population[36]; broadband (connection capable of 512 kilobits per second) – 99 per cent of households.[37] • Connections in the UK: fixed line – 54.2 per 100 people; mobile – 126 per 100 people; 3G – 29.4 per 100 people; broadband – 67.1 per 100 households.[38]
Prices	• UK has low average monthly subscription prices for broadband among OECD countries – $30.63 compared to $35.60 in France and $48.22 in Germany.[39]
Efficiency	• Local Loop Unbundling has led to more efficient use of the fixed network, with greater choice and price competition for consumers over the same network. • As fibre optics are deployed deeper into the network, factors such as line length will have a decreasing impact on the fixed network.
Quality	• Average broadband speed is 4.1 megabits per second[40] but there is local variation (and some "not-spots"). • 10 per cent of broadband connections have a headline speed above 8 megabits per second compared with 26 per cent in France and 18 per cent in Germany.[38]
Resilience	• Communications infrastructure resilience is enhanced by large amounts of diversity and network architecture that builds in spare capacity and the ability to route round problems. The communications sector is inherently resilient – it has developed a multilayered approach to resilience which, coupled with the overlapping nature of telecommunications networks, makes the sector one of the most robust areas of the critical national infrastructure.
Major challenges	• In order to remain competitive, the UK will need to keep up with technological progress. • Universal accessibility is often a challenge. • Other infrastructure networks are increasingly dependent on the use of technology and therefore communications networks.
Major projects in the pipeline	• The market is expected to deliver next generation broadband to 60-70 per cent of the population. After this point, the commercial case weakens considerably and the Government has announced that it will support investment so that 90 per cent of the population has access to next generation broadband by 2017. • The Government will spend £200 million on its Universal Service Commitment to ensure that all homes have access to a broadband line capable of delivering two megabits per second. • The market is expected to deliver investment in infrastructure for 4th Generation mobile technology, supported by the Government's Spectrum Modernisation Programme.

[36] 2008 figures, *The Communications Market*, Ofcom, 2009

[37] *Digital Britain Interim Report*, Department for Business, Enterprise and Regulatory Reform and Department for Culture, Media and Sport, January 2009

[38] 2008 figures, *International Communications Market Report Statistical Release*, Ofcom, 2009

[39] October 2008 figures in US$ PPP, *OECD Broadband Portal*

[40] *UK Broadband Speeds*, Ofcom, July 2009

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