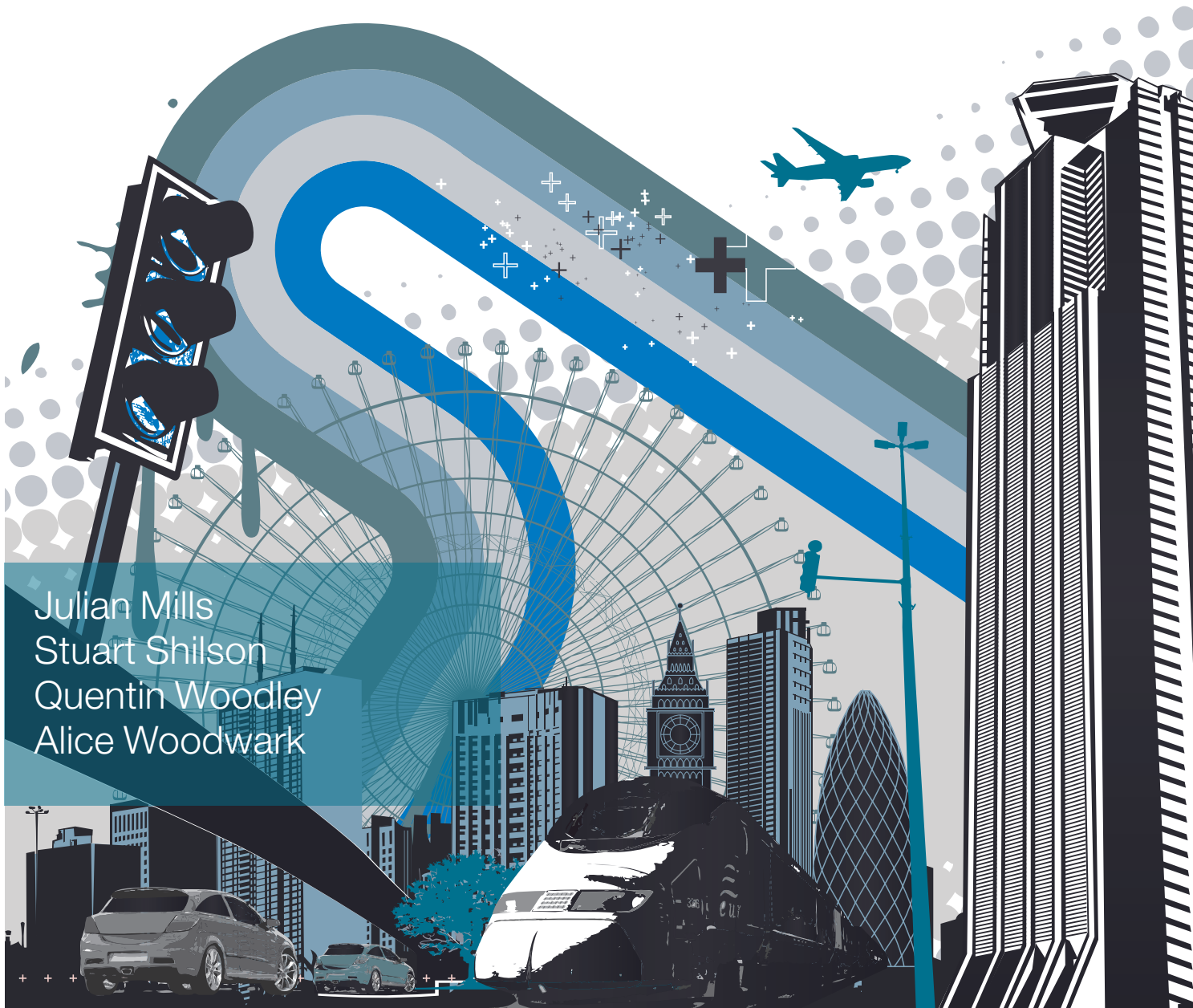


# Keeping Britain moving

The United Kingdom's transport infrastructure needs



Julian Mills  
Stuart Shilson  
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This report summarises independent analysis undertaken by McKinsey & Company about the United Kingdom's strategic transport infrastructure needs and the investment required to meet those needs. It also sets out some options for funding that investment. While we are grateful for the contributions from the many industry figures we interviewed, the views expressed are those of McKinsey alone.

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# *Executive summary*

Good transport infrastructure underpins economic growth. The United Kingdom's strategic roads, railways and airports<sup>1</sup> are, however, some of the most congested in the world. On average, for each kilometre of motorway 113 million passenger vehicle kilometres are driven nationally each year, against 47 million in Germany, 39 million in France and 36 million in the United States. In addition, the UK's roads carry more freight per kilometre of motorway than any other major economy apart from Japan. The railways are carrying more passengers than at any time in the past 60 years, on a network roughly three-fifths of its size in 1950. Meanwhile, most major UK airports compare poorly with their international counterparts, although recent upgrades have improved facilities. The 2010 Skytrax survey, for example, ranks Heathrow 21st out of 163 airports worldwide for the quality of its infrastructure (up from 57th in 2009), Gatwick 64th and Stansted 99th.

Demand will also increase significantly. By 2030, the average UK resident is expected to drive an extra 1,100 kilometres a year, increase use of long-distance trains and take one more flight than he or she does at the moment. The combined effects of population growth and increased travel over the next two decades, other things being equal, will be to increase passenger numbers on the roads by almost 30 percent, rail travel by 50 percent and the number of flights originating in the United Kingdom by as much as 75 percent.

So, as the nation works to strengthen its economy and finances, it faces a period of unprecedented investment to maintain and enhance the quality of its transport assets. McKinsey estimates that the cost of maintaining, renewing and expanding the United Kingdom's transport infrastructure will be around £350 billion over the next two decades<sup>2</sup> – a 45 percent increase on average annual spending since the turn of the 21st century.

The government's recent Comprehensive Spending Review (CSR) and National Infrastructure Plan (NIP) acknowledge the scale of transport infrastructure needs.<sup>3</sup> Both emphasise the importance of investment in economic infrastructure to promote growth. Cuts to transport infrastructure funding contained in the CSR are much lower than many had expected. Even so, the UK government is likely to spend 18 percent less on transport infrastructure over the next five years than it did over the previous five.<sup>4</sup> And, taking a medium-term view, we estimate that there will be a substantial public-sector funding gap for road and rail of around £100 billion between 2010 and 2030, the equivalent of £5 billion a year (Exhibit 1).

The United Kingdom needs to close this gap. We see two options for achieving this, without increasing general taxation. The builders and operators of our transport infrastructure can further improve their productivity; and the users of our transport assets – vehicle owners in particular – can contribute more. We recognise that both these options are challenging for a range of reasons: it is for politicians to judge which alternative is most acceptable.

<sup>1</sup> Referred to in this report as "road", "rail" and "air" respectively.

<sup>2</sup> McKinsey UK strategic transport infrastructure model, February 2011.

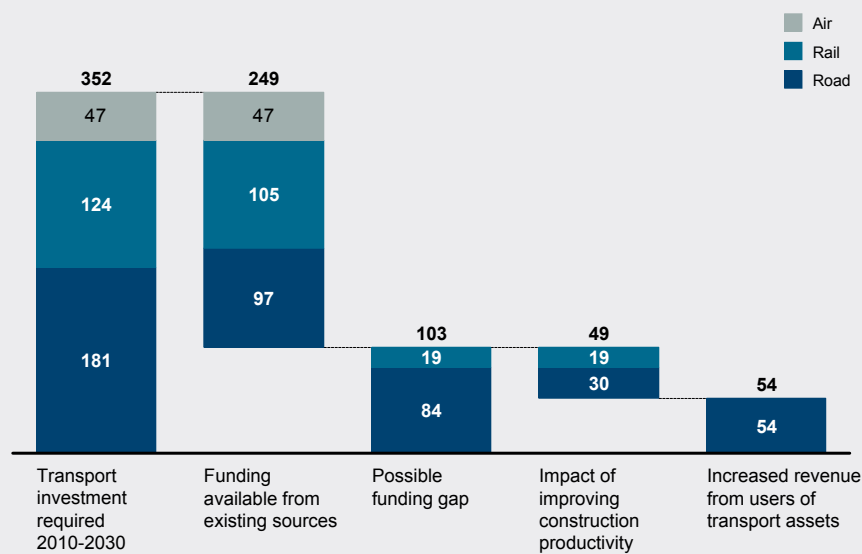
<sup>3</sup> UK National Infrastructure Plan 2010 and the Comprehensive Spending Review 2010.

<sup>4</sup> McKinsey analysis of the Resource and Capital DEL budgets for 2010-11 to 2014-15 set out on pages 10-11 and 22 of the Comprehensive Spending Review 2010.

## Exhibit 1

## Closing the United Kingdom's funding gap for transport infrastructure

£bn at 2010 value of money



Source: McKinsey UK strategic transport infrastructure model, February 2011

The United Kingdom has significantly improved construction and maintenance productivity for transport assets in recent years. Between 1998 and 2005, construction productivity increased by 1.7 percent a year compared with 0.3 percent in Germany and 0.1 percent in Spain.<sup>5</sup> However, as HM Treasury's recent Infrastructure Cost Review made clear, there is still considerable room to do better. McKinsey estimates that construction and maintenance costs for UK transport assets could fall by up to 16 percent, on top of the efficiency savings already targeted. This is equivalent to maintaining the recent rate of productivity growth for the next two decades. Doing so would eliminate the funding gap in rail and reduce the shortfall in road expenditure to around £55 billion.

The difference could be made up by boosting revenues from road users to a level similar to that in other parts of Europe. In the United Kingdom, road users pay, in total, around 6 pence to use a kilometre of road.<sup>6</sup> This is between 10 and 25 percent less than drivers in France, Germany and Switzerland. In the long term, road pricing may well be the best mechanism for collecting this revenue – and for replacing some of the £26 billion of fuel duty that will be lost if, as expected, electric cars start to become more commonplace.<sup>7</sup> But, in the short term, increasing fuel or vehicle duty may be a quicker, more cost-effective and less risky way to close the funding gap. Persuading road users of the benefits of paying more will be a challenge whichever route is chosen.

<sup>5</sup> McKinsey Global Institute: "Beyond Austerity: A Path to Economic Growth and Renewal in Europe," October 2010.

<sup>6</sup> McKinsey analysis based on statements of 2009 fuel duty, vehicle tax and toll income (as reported by each country's finance ministry) and vehicle kilometres as stated by World Road Statistics 2007. Analysis excludes VAT and other taxes.

<sup>7</sup> *The McKinsey Quarterly*: "The fast lane to the adoption of electric cars," February 2011, projects that in 2015, electric vehicles will account for 16 percent of new car sales in New York, 9 percent in Paris and 5 percent in Shanghai.

## The United Kingdom's transport needs in 2030

UK investment in transport infrastructure has ebbed and flowed over the past 40 years (Exhibit 2).

- **Road.** Since the major motorway building programme came to an end in the early 1970s, investment in the country's strategic road network has declined sharply in real terms. By 2000, road spending had fallen to 50 percent of its 1975 levels, though it has since increased again and is currently 75 percent of 1975 levels.
- **Rail.** Investment in rail had also declined sharply by the early 1980s, to just 25 percent of early 1970s levels. However, spending has risen since 1985, partly in response to the Hatfield crash of October 2000, and is now twice as high as it has been at any point between 1970 and 2000.

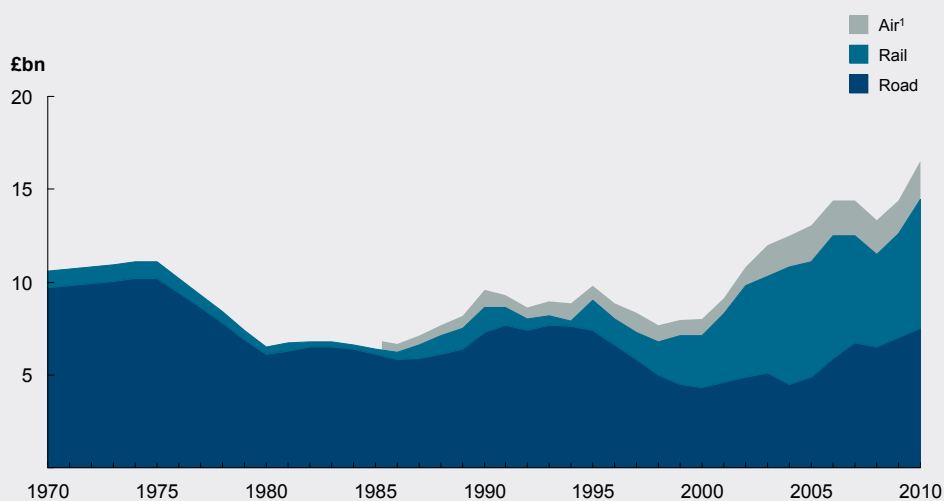
- **Air.** Investment fell back after the major terminal and runway building programmes of the 1960s and early 1970s. However, it picked up again in the mid- to late-1980s when new terminals were built at Heathrow (Terminal 4) and Gatwick (North Terminal) and runways at Stansted and Manchester were extended. Since then, significant sums have been spent to rebuild existing airport infrastructure. In addition, the British Airports Authority (BAA) recently spent more than £4 billion building Terminal 5 at Heathrow.

The United Kingdom now needs to increase significantly its investment in building and renewing transport infrastructure, in order to meet the increasing demand for transport that comes from a growing population and that population's increasing propensity to travel, and to provide the conditions for productive economic growth.

### Exhibit 2

#### United Kingdom transport infrastructure investment, 1970–2010

£bn at 2010 prices



1 Air data not available before 1985

Source: Office for National Statistics, Department for Transport, British Airports Authority

The United Kingdom's roads are among the most congested in the developed world. On average, for each kilometre of motorway 113 million passenger vehicle kilometres are driven nationally each year, against 76 million in Japan, 47 million in Germany, 39 million in France and 36 million in the United States (Exhibit 3). In addition, the UK's roads carry more freight per kilometre of motorway than any other major economy apart from Japan. Sustained economic growth will depend in part on improved road conditions for freight and logistics operators.

The rail network has improved significantly over the past decade, but still requires substantial work to meet the demands of the 21st century. For example, wiring on the Great Eastern Main Line is 60 years old, unreliable and sensitive to temperature increases. It is costly to maintain and disrupts the line's performance.<sup>8</sup> And, as the NIP points out, the railways are carrying more passengers than at any time in the past 60 years, on a network roughly three-fifths of its size in 1950.<sup>9</sup>

Meanwhile, most major UK airports compare poorly with their international counterparts, although recent upgrades have improved facilities. The 2010 Skytrax survey, for example, ranks Heathrow 21st out of 163 airports worldwide for the quality of its infrastructure (up from 57th in 2009), Gatwick 64th and Stansted 99th.<sup>10</sup>

Demand will also increase significantly: the Department for Transport, for instance, believes the UK population will grow by 11–14 percent over the next 20 years and that each person will travel more. By 2030, the average UK resident is expected to drive an extra 1,100 kilometres a year, increase use of long-distance trains and take one more flight than he or she does at the moment. The combined effects of population growth and increased travel over the next two decades, other things being equal, will be to increase passenger numbers on the roads by almost 30 percent, rail travel by 50 percent (Exhibit 4)<sup>11</sup> and the number of flights originating in the United Kingdom by as much as 75 percent.

<sup>8</sup> Network Rail Control Period 4 Delivery Plan, 2009.

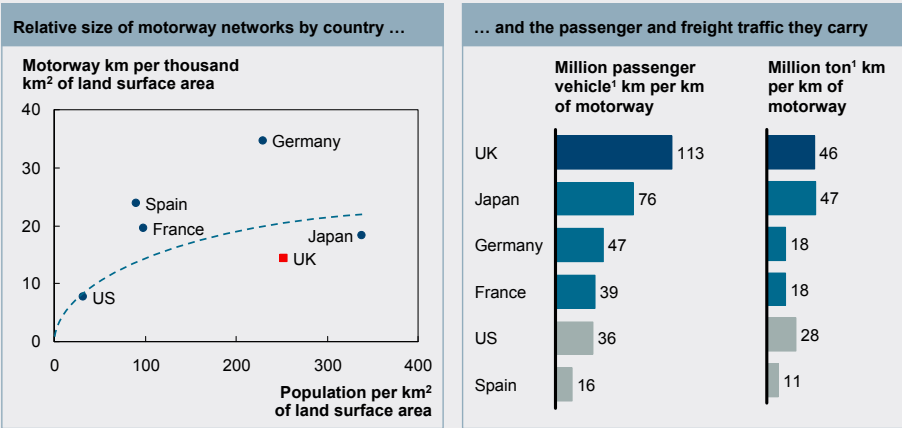
<sup>9</sup> "Transport Statistics Great Britain: 2009 edition," Department for Transport.

<sup>10</sup> Skytrax airport rankings, 2010.

<sup>11</sup> National Transport Model, Department for Transport.

Exhibit 3

Congestion on national road networks

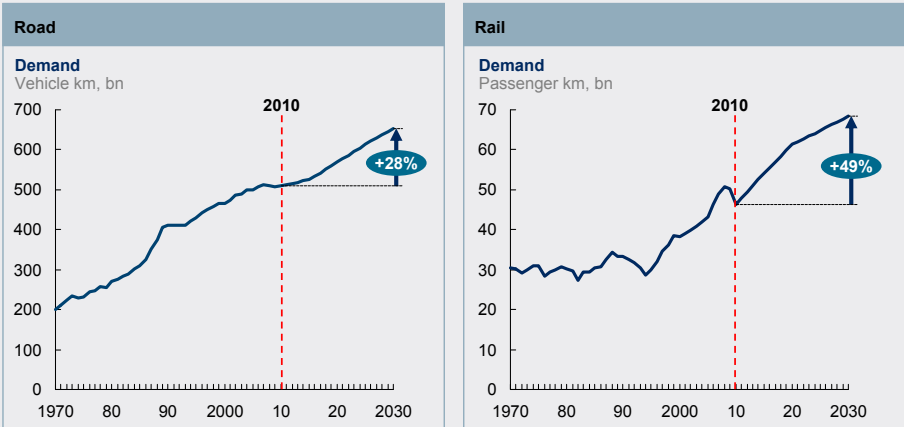


1 Passenger vehicle and ton kilometre data is for all road types nationally  
Source: Central Intelligence Agency World Factbook

Exhibit 4

Passengers on the United Kingdom’s roads and railways, 1970–2030

Demand by transport mode, actual 1970–2010, projected 2010–2030



Source: Department for Transport, statistics demand projections; McKinsey UK strategic transport infrastructure model, February 2011

The transport investment needed

Assessing the cost of building transport infrastructure is difficult. Budget overruns are common and the outturn cost for similar infrastructure can vary by 100 percent. Indeed, the Department for Transport advises that 44 to 66 percent be added to initial project budgets to correct for what it calls “optimism bias”.<sup>12</sup>

Our research suggests that the United Kingdom will need to spend a little over £350 billion over the next 20 years to maintain and renew existing infrastructure and to increase capacity to meet projected demand (Exhibit 5). This represents an annual increase of 45 percent relative to spending over the past decade – a period, for the most part, of unprecedented economic prosperity and investment. Our projections assume that congestion and hence delays on

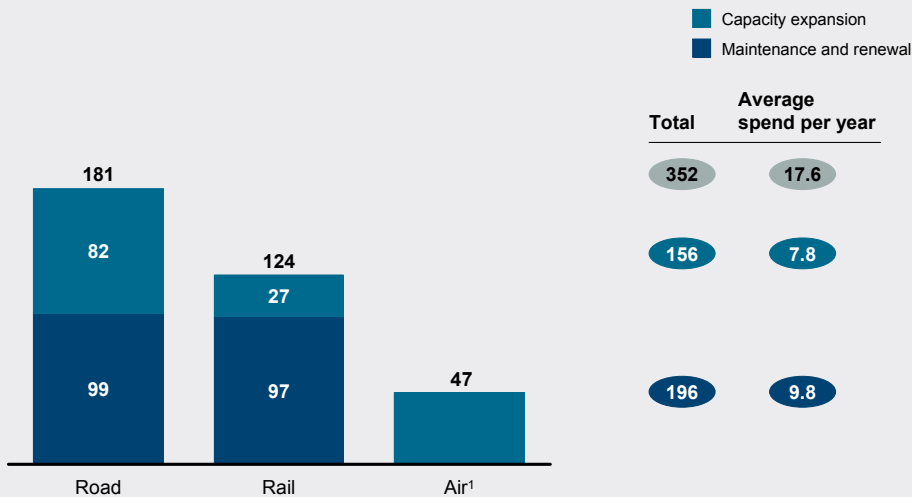
each mode of transport in 2030 will be roughly similar to levels today, and that relative pricing between modes will stay constant. We also assume that the United Kingdom will continue to support its existing rail network, even though every £1 spent on roads benefits more than ten times as many users as would £1 spent on the railways.<sup>13</sup>

Road investment will account for just over 50 percent (around £180 billion) of this total, or £9 billion a year (two-thirds more on average than the £5.4 billion of annual spending over the past decade<sup>14</sup>). We estimate that maintaining and renewing existing road assets will cost £5 billion a year. The remaining £4 billion will be required to address “choke” points and to expand capacity on the most congested arteries. Even with this investment, roads will carry more cars per mile than today. However, on the assumption that traffic management technologies continue to

Exhibit 5

Projected United Kingdom spending on transport infrastructure, 2011–2030

£bn at 2010 prices



1 Air maintenance and renewal costs are not considered, as they are not significantly affected by public funding or planning processes

Source: McKinsey UK strategic transport infrastructure model, February 2011

<sup>12</sup> “The estimation and treatment of scheme costs,” September 2006, Department for Transport.  
<sup>13</sup> The Department for Transport estimates that the UK road network supported 507 billion vehicle kilometres in 2009 while the rail network supported 50 billion passenger kilometres in the same year.  
<sup>14</sup> £5.4 billion average real road infrastructure expenditure, 2000-09 (2010 prices), based on Department for Transport road infrastructure spending statistics, 1985-2005, and the Highways Agency annual business plans, 2002-11.

develop at the same rate as they have done over the past two decades, drivers' perception of congestion will be as it is now.

The rail network will account for 35 percent (almost £125 billion) of the projected total. This translates into an average projected annual expenditure of £6.2 billion, 11 percent higher than the average £5.6 billion spent over the past decade.<sup>15</sup> The average cost per year over the next 20 years of maintaining and renewing the existing rail network will be £4.8 billion, while the remaining £1.4 billion a year will provide vital capacity increases. These figures assume that Network Rail achieves the challenging efficiency savings to which it has committed itself in its regulatory settlement for the next five years. Given the government's backing for High Speed 2 in the CSR, we have included this £11 billion project in our forecasts.

The expansion of airport capacity accounts for the remaining 13 percent (a little over £45 billion) of the total expected infrastructure investment – equivalent to £2.4 billion a year. Merely meeting the needs of passengers originating in the United Kingdom will cost around £38 billion over the next 20 years. However, if the country wishes to preserve its status as a major international hub for transit passengers, a further £9 billion of airport investment may be required. If it fails to make this investment and capacity for transfer passengers drops, Heathrow may lose its status as one of the world's major air hubs with the consequence that flying directly from the United Kingdom to some current destinations may cease to be economically viable. Any reduction in international air connections will probably have a negative impact on the rate of GDP growth.

## The funding challenge

Over the past decade, the public sector has contributed around 80 percent of all investment for roads, the rail network and airports. The Department for Transport and local government have between them funded road projects almost in their entirety. The Department for Transport has subsidised at least 70 percent of the costs of Network Rail, and possibly even more when its net subsidy to train operating companies is included.<sup>16</sup> Only airports have been largely (86 percent) privately funded.<sup>17</sup> Notwithstanding the more generous than expected transport settlement in the CSR, the structural deficit means the old funding model will become unsustainable over the next 20 years.

Our assessment of how much public funding might be available for transport infrastructure assumes that the Department for Transport's budget declines between now and 2014–15 in line with projections laid out in the 2010 Spending Review (Exhibit 6). We have then assumed that road funding recovers gradually to current levels over the following 15 years, while rail funding stays flat. We are, therefore, implicitly assuming that the department maintains its broadly equal allocation of funding to the strategic road network and rail infrastructure.

Our analysis of the funding challenge suggests that the United Kingdom must find an additional £100 billion or more over and above the funds available from government between 2010 and 2030 if it is to maintain the strategic transport infrastructure on which the economy relies. This funding gap is concentrated on road (around 80 percent of the total) and rail (around 20 percent). Airport owners, by contrast, will

<sup>15</sup> £5.6 billion average real rail infrastructure expenditure, 2000–09 (2010 prices), based on the Office of Rail Regulation's year book (Network Rail CP4 update, 2010) and Department for Transport Statistics Transport Trends, 1986–2008.

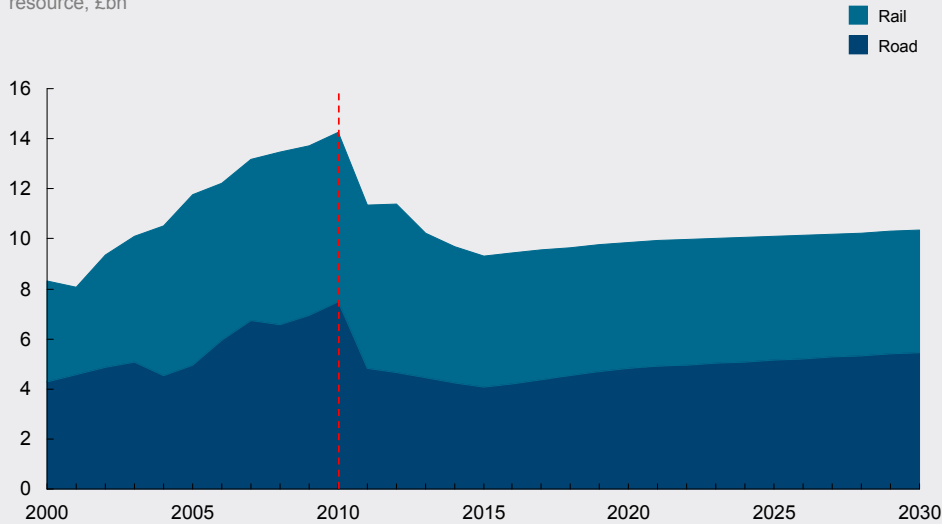
<sup>16</sup> Train operating companies in aggregate receive a net subsidy, some of which flows through to Network Rail in the form of network access charges.

<sup>17</sup> Based on analysis of financial results for the British Airports Authority, Manchester Airport Group and other United Kingdom airport operators.

## Exhibit 6

### Assumed central government funding for transport infrastructure

Annual government funding (plus access charges and 3<sup>rd</sup> party funding for rail), capital and resource, £bn



Source: HM Treasury Comprehensive Spending Review, 2010; McKinsey United Kingdom strategic transport infrastructure model, February 2011

probably be able to cover their investment requirements without raising aeronautical charges above European benchmarks. A funding challenge for airports is likely only if the government decides to move London's major airport to a new location (for example, the Thames estuary).

The potential economic consequences of failing to close the £100 billion public funding gap are severe. GDP growth could be reduced by up to half a percentage point – around one-fifth of the expected national growth rate based on long-term historic trends.<sup>18</sup> Around half of this reduction in GDP growth would be likely to come from lost labour productivity, as workers sit in traffic jams or experience rail or air delays; the direct impact of reduced construction industry expenditure would account for the rest.

There are, however, two complementary steps that can be taken to tackle the remaining shortfall, without increasing general taxation: cut the costs of building and maintaining

infrastructure on the one hand and increase revenues from transport infrastructure users on the other. If the construction sector can maintain the above-average productivity growth seen in recent years, construction costs will be lowered by up to 16 percent over our forecast period. This will eliminate the funding gap in rail and reduce it in road to slightly over £50 billion. To close this remaining gap, the United Kingdom may need to find ways to raise £2.7 billion more revenue each year from road users in return for preventing any increase in congestion.

### Reducing the cost of construction

Building and maintaining UK infrastructure is expensive. HM Treasury's recent Infrastructure Cost Review (ICR)<sup>19</sup> points out that "top-down analysis of benchmarks... including high-speed rail, roads... and tunnelling indicates higher outturn costs in the UK [than elsewhere in Western Europe], ranging from a factor of 10 percent to over a 100 percent difference." The country is densely populated. So more

<sup>18</sup> Eddington Report, "Part 1: Transport's role in sustaining the United Kingdom's productivity and competitiveness"; Oxford Economics.

<sup>19</sup> "Infrastructure Cost Review," produced by HM Treasury and Infrastructure UK in December 2010.

## Attracting private capital for transport infrastructure

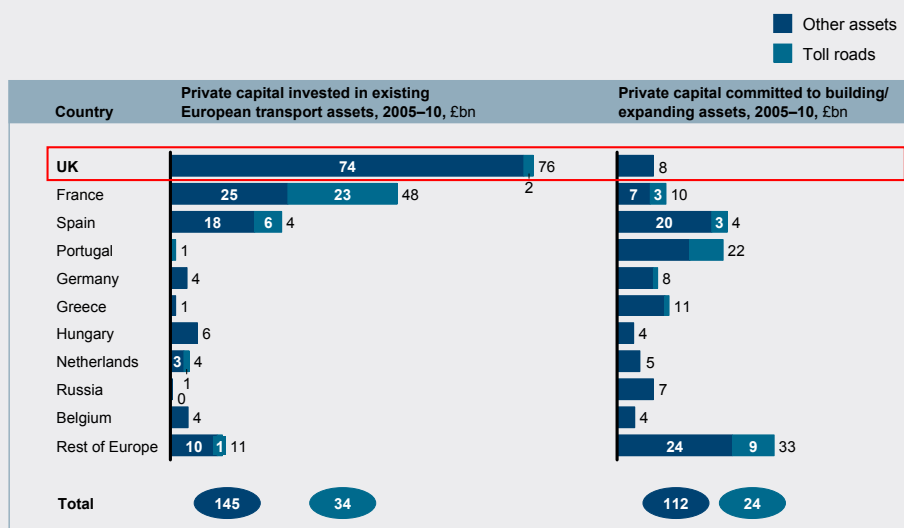
The NIP emphasizes that private capital could play a role in financing infrastructure. However, if transport assets are to attract private investors, they will need to generate cash flows. As explained above, the United Kingdom's government will, in future, struggle to fund these cash flows (known as "availability" payments). And, unlike in some other European countries, users of transport assets in the United Kingdom are not accustomed to paying money directly to infrastructure providers – for example, via road tolls.

Later in this paper, we define the actions the United Kingdom government could take to free up or generate the required funding for transport assets. If these steps are successfully implemented, it would be feasible to tap private sector financing capacity – should doing so be attractive.

Our analysis suggests that, under these necessary conditions, the private sector would be prepared to invest in the country's transport infrastructure assets, even though several high-profile investments (for example, Metronet or the M6 toll road) have under-performed. Over the last five years, the United Kingdom has attracted 27 percent of all investment in European transport assets (Exhibit 7). Much of this investment has been focused on mature transport assets, but the private sector's willingness to invest in new build projects in other sectors, such as social housing, suggests that an appetite also exists for greenfield developments.

### Exhibit 7

#### Private capital invested in transport infrastructure in Europe, 2005–10



Source: Infrastructure Journal

Moreover, the private sector has substantial capital to invest. The banks, infrastructure funds, and private equity houses which, between them, contributed 75% of private sector financing for transport infrastructure assets between 2005 and 2010, raised £26 billion in new commitments in 2010 alone.

infrastructure is built on brownfield land than in North America or the rest of Western Europe. Planning processes are slow, cumbersome and costly. Environmental, ecological and heritage restrictions create delays and add costs: the ICR illustrates this by commenting that “work on part of a £53 million rail bridge project is to be delayed...after the discovery of a colony of 11 great-crested newts.” Much of the transport infrastructure is old, which drives up maintenance costs. Finally, contracting processes, especially in the public sector, add cost and complexity.

Despite these serious challenges, many infrastructure providers, such as Network Rail, have improved construction productivity significantly over the past decade. Following the publication of the Egan report,<sup>20</sup> construction productivity grew by 1.7 percent a year between 1998 and 2005, compared with 0.3 percent a year over the same period in Germany and 0.1 percent a year in Spain.<sup>21</sup> However, productivity still varies widely between projects. For example, in 2009 the “demonstration projects” set up following Egan’s principles displayed almost twice the productivity of the industry average.<sup>22</sup> As a result, it is widely acknowledged in the industry that there is considerable scope for further improvement.

Based on our work with a wide range of infrastructure providers and operators both in the United Kingdom and around the world we assess it is feasible to reduce UK infrastructure build and maintenance costs by as much as 16 percent more than envisaged in current plans. This is equivalent to assuming that UK construction productivity continues to improve by 1.7 percent a year (the rate between 1998 and 2005) for the next 20 years. Our estimate is consistent with the 15 percent target set out in HM Treasury’s ICR.

Achieving this 16 percent saving will require changes across the construction value chain (Exhibit 8). Planning governance needs to be

simplified and timescales shortened, contracting and sub-contracting practices need to evolve (especially in the public sector), and front-line staff and those who manage and oversee them need to continue to increase their productivity.

Upfront planning accounts, on average, for 3 percent of combined road and rail expenditure in the United Kingdom (although for greenfield projects the proportion is much higher). Planning processes continue to be prolonged in spite of a number of attempts over the past decade to reform the planning regime. Our analysis of a number of major transport infrastructure projects found that the planning inquiry itself usually lasted less than a year. However, the application process on average took 14 months, producing a report of the inquiry required 12 months, and once the report had been produced, a further 17 months elapsed before a decision could be reached (Exhibit 9). At each stage, infrastructure providers incurred significant legal fees and other costs, sometimes stretching into hundreds of millions of pounds. If the typical four-year planning process could be shortened by just 6 or 12 months, the funding gap would fall by between £1 billion and £2 billion.<sup>23</sup> Moreover, many believe that simplifying and shortening the planning process would save costs by reducing complexity during the design and build phases of a typical project.

Land costs may be minimal for renewal or maintenance work, but they can account for around 10 percent of spending on new roads or rail capacity. Around 75 percent of all UK transport projects are built on brownfield land, compared with about 55 percent in continental Europe or the United States.<sup>24</sup> As a result, infrastructure developers in the United Kingdom tend to encounter more resistance from affected members of the public and have to pay higher levels of compensation. Unless more greenbelt land becomes available, this pattern is likely to continue and land costs are likely to remain high.

<sup>20</sup> “Rethinking Construction,” produced by an industry task force chaired by Sir John Egan.

<sup>21</sup> McKinsey Global Institute: “Beyond Austerity: A Path to Economic Growth and Renewal in Europe,” October 2010.

<sup>22</sup> *Ibid.*

<sup>23</sup> Analysis excludes Heathrow Terminal 5, but includes the other examples shown.

<sup>24</sup> *Infrastructure Journal*, July 2010.

Exhibit 8

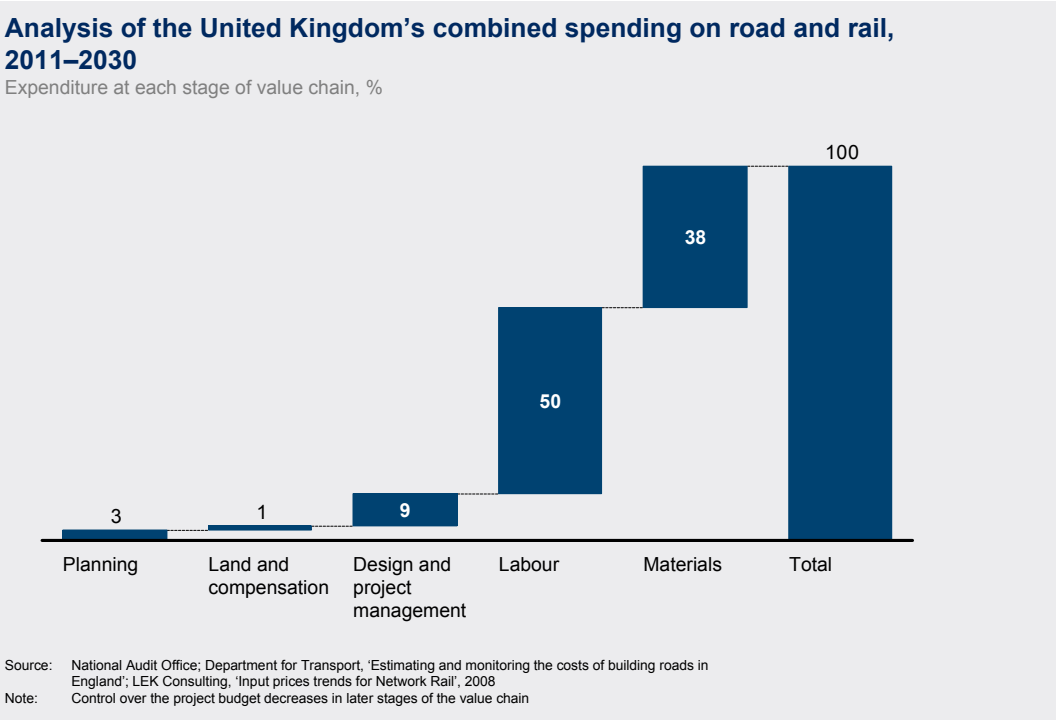
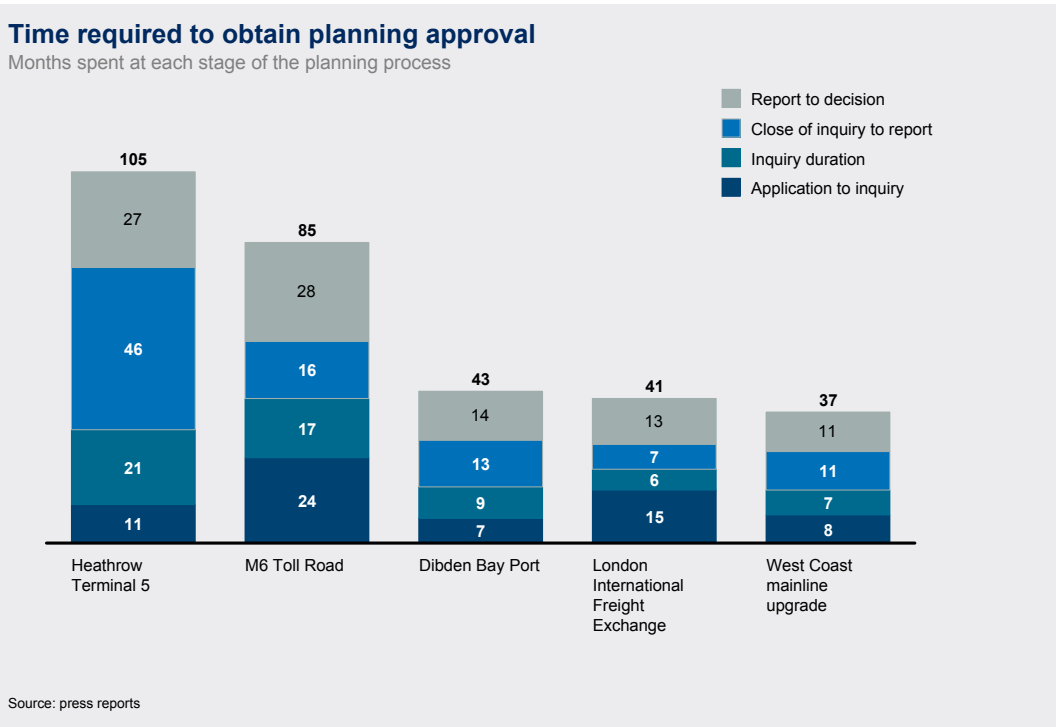


Exhibit 9



Opportunities to reduce costs incurred in the design phase are more limited, although poor design specifications can obviously greatly inflate costs during the construction phase itself. We have seen sophisticated road developers and operators outside the United Kingdom save at least 5 percent of expenditure at this design stage through improved use of standard specifications, advanced costing methodologies and risk-management tools. Overall, this could save a further £1 billion to £2 billion.

Front-line labour and the cost of those who manage and oversee it accounts for 50 percent of combined road and rail expenditure. Despite much progress over recent years, labour productivity can still improve significantly in two areas.

- Infrastructure clients and construction firms need to work together to reduce the complexity of project management and to promote joined up end-to-end working. The ICR points out that “there are higher levels of subcontracting in the UK” and that these “second- and third-tier suppliers are not always effectively integrated at an early enough stage [even though they] are often providing the bulk of the construction capability.” It is common to see front-line staff being supervised by several different managers, who spend much of their time trying to resolve complex interfaces between separate organisations. This situation creates confusion, undermines accountability and adds cost.
- Inadequate planning and day-to-day supervision result in low “wrench time” (that is, productive time on the ground) for many front-line staff. For example, at a major transport organisation reliant on subcontractors, we found that front-line staff were working productively for only around 10 percent of their shift. They spent most of their shift waiting for tools, specialist colleagues, and access to the site, or walking to collect missing items. The quality of work was low and so rework was common.

In our experience, better supervision and front-line planning can, on average, cut total labour costs by 20 percent or more. Such a saving would shrink the unfunded investment gap by between £25 billion and £35 billion.

Materials costs make up just under 40 percent of spending on road and rail projects. In road, the major categories include aggregates and bitumen, in addition to high-tech and low-tech roadside “furniture.” In rail, the major categories include steel, general construction materials, concrete and aggregates, and telecoms and IT equipment. In many of these categories it is challenging to negotiate further discounts with suppliers. However, we have seen sophisticated players use a combination of a “design to value” approach and complex demand-management techniques to achieve substantial savings.

Taken together, these productivity-based cost-reduction measures could probably reduce the required expenditure on road and rail by almost £50 billion over the next 20 years. Achieving these savings would effectively eliminate the £19 billion funding gap for rail infrastructure. In road, however, a substantial funding gap of more than £50 billion will remain.

### Earning more money from UK roads

The United Kingdom, therefore, needs to find up to an extra £2.7 billion annually to fund its road network over the next 20 years. One option is to make road users pay more for the investment needed to prevent congestion getting worse. We recognise that such an approach is challenging, not least because there is a widely held perception that the costs borne by road users are already too high.

In fact, using UK roads is, on average, cheaper than using roads in France, Germany or Switzerland. Our analysis of 2009 data from each country’s finance ministry shows that whereas the average Briton paid around 6 pence per kilometre in taxes

and tolls in 2009 (excluding VAT), our French, Swiss and German counterparts paid between 6.7 pence and 7.7 pence (Exhibit 10).<sup>25</sup> Increases in fuel duty since then have probably raised the cost per kilometre in the United Kingdom by around 0.5 pence in 2011, but the total cost per kilometre is still lower here than in other countries in Europe.

In the United Kingdom, 98 percent of road-related revenue comes from taxes, rather than tolls, although these taxes are not hypothecated for road upkeep and construction. In France, Switzerland and Germany, taxes amount to about the same as they do here, but road users pay between 0.6 pence and 1.8 pence per kilometre in tolls. If UK road users were to pay a further 0.5 pence per vehicle kilometre either in tolls or taxes this would be sufficient to close the remaining public-sector funding gap.

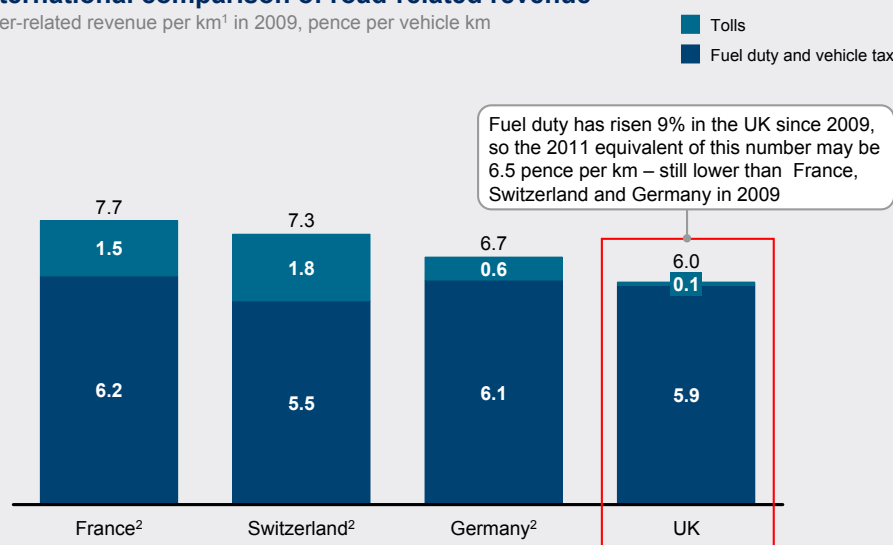
Road pricing is one way to raise this additional revenue – and was, in fact, how many roads were built and maintained in the 18th and 19th

centuries. In the long term, as migration to electric cars takes place, road pricing is likely to be a necessity to replace declining fuel duty (from which the UK government currently raises £26 billion a year). The shift to electric cars will, however, be gradual: McKinsey's research on behalf of the city authorities of New York and Shanghai, and the French government, suggests that in 2015, 5 to 16 percent of new vehicles bought in these cities will be powered by electricity.<sup>26</sup> If properly implemented, road pricing would also help to manage demand and hence congestion. Paradoxically, however, the United Kingdom cannot afford too great a shift from road to rail or bus use, especially on the busiest parts of their networks. If road pricing persuaded even 1 percent of drivers to switch to rail, passenger volumes on trains would increase by up to 10 percent. If 1 percent of drivers switched instead to buses, bus passenger volumes would increase by over 15 percent.<sup>27</sup> Although the existing rail and bus networks would absorb some of this demand, both might require investment in additional capacity in

## Exhibit 10

### International comparison of road-related revenue

User-related revenue per km<sup>1</sup> in 2009, pence per vehicle km



<sup>1</sup> Revenue data is for 2009, vehicle data is for 2007

<sup>2</sup> Average exchange rate in 2009 was €1.12:£1 and CHF1.70:£1

Source: Comité des Constructeurs Français d'Automobiles; Eidgenössische Finanzverwaltung; Bundesministerium der Finanzen; HM Revenue and Customs; World Road Statistics 2009

<sup>25</sup> McKinsey analysis based on statements of 2009 fuel duty, vehicle tax and toll income (as reported by each country's finance ministry) and vehicle kilometres as stated by World Road Statistics 2007. Analysis excludes VAT and other taxes.

<sup>26</sup> *The McKinsey Quarterly*: "The fast lane to the adoption of electric cars," February 2011.

<sup>27</sup> National Travel Survey 2009, Department for Transport.

busier urban areas. This might further increase the infrastructure funding gap. Hence, if the gap is to be closed, revenue must be raised from road users in a way that will not simply displace them on to other forms of transport.

Although road pricing may be a significant part of the long-term answer to the road-funding challenge, it will involve implementing various complex and unsettled technologies on a scale not yet seen anywhere in the world. In the near term, it represents a relatively inefficient way of filling the funding gap. Based on existing UK experience, anything between 10 and 50 percent of the revenue raised might be swallowed up in administration, although new technologies are likely to be more cost efficient.

In the near term, the United Kingdom already has in place a more cost efficient means of raising revenue from road users – through fuel and vehicle taxes. The government raises £31 billion each year from these two sources.

Of all the different and unpopular ways of raising funds from road users to build new road capacity, increasing road taxes is possibly the most cost efficient and easiest to implement operationally in the short term. If increases in fuel duty alone were to be relied upon, an increase from 59 pence<sup>28</sup> per litre to 65 pence per litre would be required (an 11 percent increase). Alternatively, a 50 percent increase in vehicle tax (raising the annual payment for a medium-emitting band G car such as a Ford Mondeo 2.0 litre saloon from £155 to £230) would be sufficient to close the funding gap.

Raising fuel duty to fund the gap would enable the tax burden to vary according to road usage (and emissions), but would most negatively affect commercial traffic and those who drive on business. A vehicle tax increase would allow the government to differentiate the duty according to vehicle type, and possibly use, so as to reflect the different amounts of wear and tear inflicted on roads. However, unlike road pricing or increases in fuel duty, it would not help manage demand.

Increasing revenue from road users will undoubtedly be difficult to accomplish. It will probably be necessary, however, if the United Kingdom is to expand road capacity and prevent congestion getting worse over the next 20 years. A balanced and informed debate is urgently needed on this topic to ensure the country's long-term economic recovery is underpinned by high quality transport infrastructure.

<sup>28</sup> UK Government's Business Link website. Fuel tax shown is per litre of petrol or diesel from January 1st, 2011.

# *Methodology and scope of this paper*

In this paper, we have focused on the United Kingdom's strategic transport infrastructure. In road, we have considered only the strategic network administered by the Highways Agency. In rail, we have included all assets maintained and operated by Network Rail, plus the proposed High Speed 2 project. We have excluded urban transit and metro assets – for example, the London Underground and Crossrail. Finally, we have included all major UK airports.

Our analysis considers the costs of both maintenance/renewal and capacity expansion for the strategic road infrastructure and rail network. For airports, we have focused only on capacity expansion and major renewal projects. We have excluded routine maintenance, as these continuing operational costs are typically neither publicly funded nor subject to public planning and policy decisions.

In our modelling, we have treated operating expenditure and capital expenditure separately; however, for ease of communication in this report, we have grouped them both into a single funding line.

We have based our demand projections for road and rail on the Department for Transport's intermodal National Transport model, which is driven by changes in, for example, GDP, employment, population, oil prices and car ownership. Broadly, this assumes that road demand grows at around 0.6x GDP until 2030, while rail demand grows at 0.9x GDP because of some modal switch from car drivers. Air demand is projected on a route-by-route basis, according to the different GDP growth rates in the relevant origin and destination markets. These GDP growth rates have then been adjusted using a demand multiplier based on the relative maturity of the aviation market in each location.

The level of expenditure required to meet this demand has been determined on the assumption that a minimum national aspiration should be to avoid higher levels of congestion in any mode than are experienced today. In road, for example, we have projected that, in addition to fixing the worst “choke” points, it will be necessary to build 10,000 kilometres of extra lanes if passengers are to experience delays that are no worse than they experience today. Even under this scenario, use of the UK's roads will be 10 percent higher; however, we have assumed that continuing improvements in network management and technology will enable roads to be used 10 percent more efficiently. We have then assumed that maintenance and renewal costs for roads stay at average 2000–09 levels over the next two decades in real terms.

To determine the level of public funding that will be available for road and rail infrastructure, we have followed the Comprehensive Spending Review projections until 2014–15 and then assumed that spending gradually returns to current levels over the next 15 years. For road, therefore, we have assumed that the resource budget declines by 21 percent and that the capital budget declines by half this amount, 11 percent. For rail, we have assumed that the government meets its £14 billion funding commitment to 2014–15, and that government expenditure continues at a flat rate thereafter, providing funding similar to that of the first few years of the past decade. We have also assumed that Network Rail's revenues from access charges and third parties remain as forecast to 2030.

To determine airport owners' ability to meet their investment needs, we have assessed the likely impact on aeronautical charges. This approach reveals that aeronautical charges within European benchmarks can fund the required asset renewals and capacity enhancements. We have not included any cost of moving London's major airport to a new location (for example, the Thames estuary).

Our analysis of potential construction cost savings uses the National Audit Office's categorisation of road costs<sup>29</sup> and our disaggregation of Network Rail's overall budget. Our procurement analysis draws on McKinsey's database of savings achieved in 14,000 commodity categories while working with more than 800 leading organisations around the world.

<sup>29</sup> “Estimating and Monitoring the Cost of Building Roads in England,” National Audit Office, 2007.





