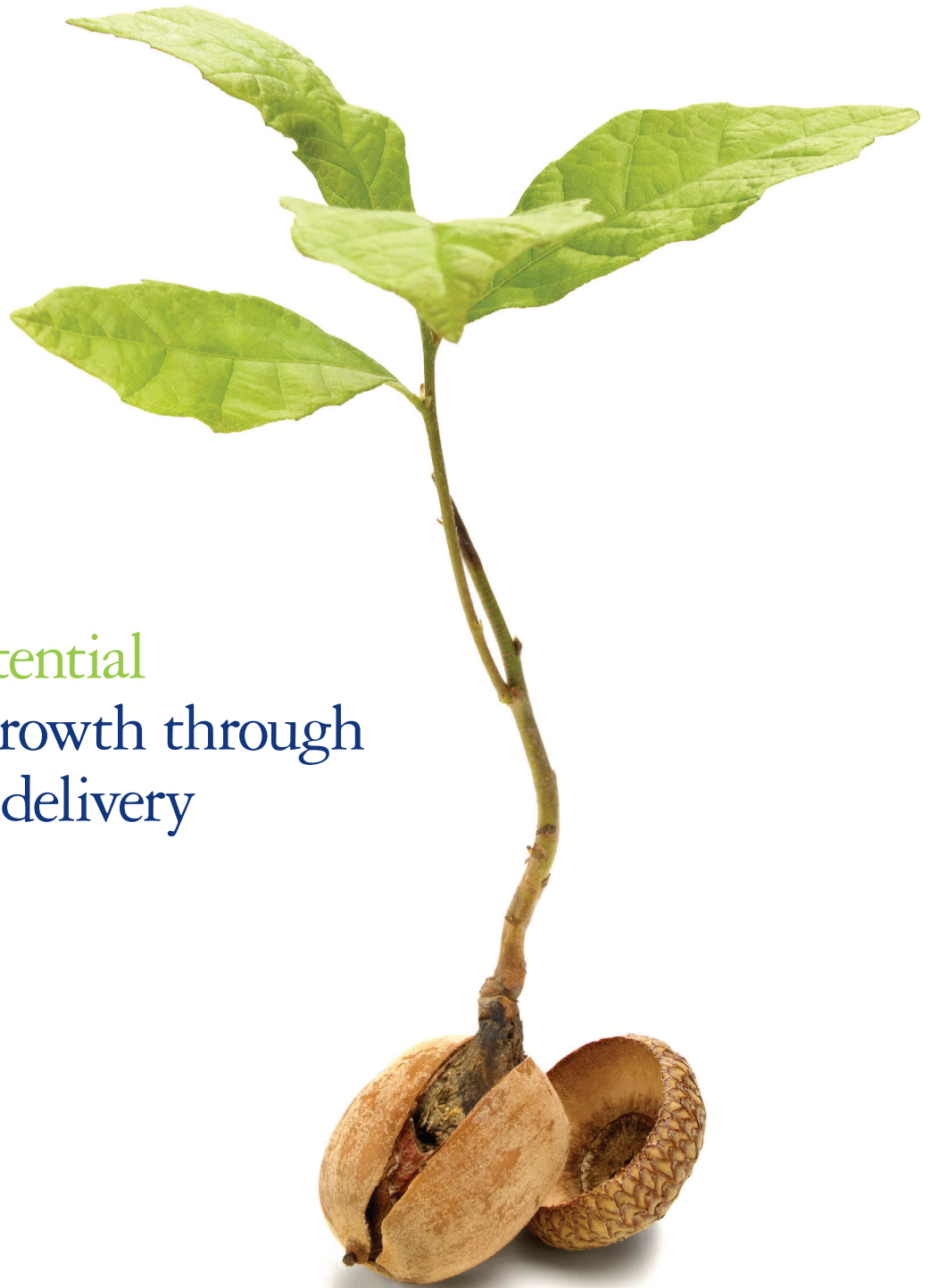


Unlocking potential  
Maximising growth through  
infrastructure delivery



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Investment in infrastructure can deliver significant benefits in the short term which conventional analysis does not recognise. The first phase of HS2 (London to West Midlands), for example, could directly support up to 70,000 jobs during its design, build and procurement, contributing £4.2bn to UK GDP over the period to 2027 in today's prices.

This paper outlines how these potential pre-operational benefits can be maximised for the UK, both driving growth in the short term and creating a strong legacy. Moreover, supporting the development of capability in the design and delivery of major infrastructure through national investment can foster export growth, enterprise creation, innovation and skills development in the UK to maximise these legacy benefits.

# Introduction

Globally, government stimulus programmes have been boosting investment in rail transport. The global market for railway infrastructure and equipment has grown at 3.2 per cent a year through the economic downturn, and is set to grow at around 2.7 per cent a year until 2017.<sup>1</sup> By implementing the right measures now, UK business can be in a prime position to tap into this potential growth market.

There is significant debate around the role of infrastructure in stimulating economic recovery, and in the UK, the Government is urgently pursuing measures to kick-start growth.

Major infrastructure projects usually take many years to deliver operational benefits and the focus of appraisal is often on these longer-term operational outcomes relative to their lifetime costs.

However, short to medium term pre-operational activities (the design, build and procurement) of major infrastructure projects generate economic benefits and could be leveraged to provide significant additional supply-side legacy impacts for the UK. These 'legacy impacts' are the residual long-term positive externalities. They arise through enhanced skills and capabilities amongst the UK workforce and business base, and can be used for future projects of a similar nature in the UK or abroad.

**This study assesses and quantifies the potential economic impact before the operational phase of a major infrastructure project. It also considers potential legacy benefits and examines how they could be maximised for the UK.**

In short, for major programmes, we believe the pre-operational benefits should all be considered as specific benefits at the project appraisal and initiation stages.

## How big is the 'pie', and can we make it bigger?

Presently, the pre-operational demand-side and supply-side value unlocked from infrastructure capital expenditure has been overlooked. HM Treasury appraisal guidelines, as embodied in the Green Book, have made clear that the pre-operational benefits of major investment programmes should not be included in overall benefit calculations.<sup>2</sup>

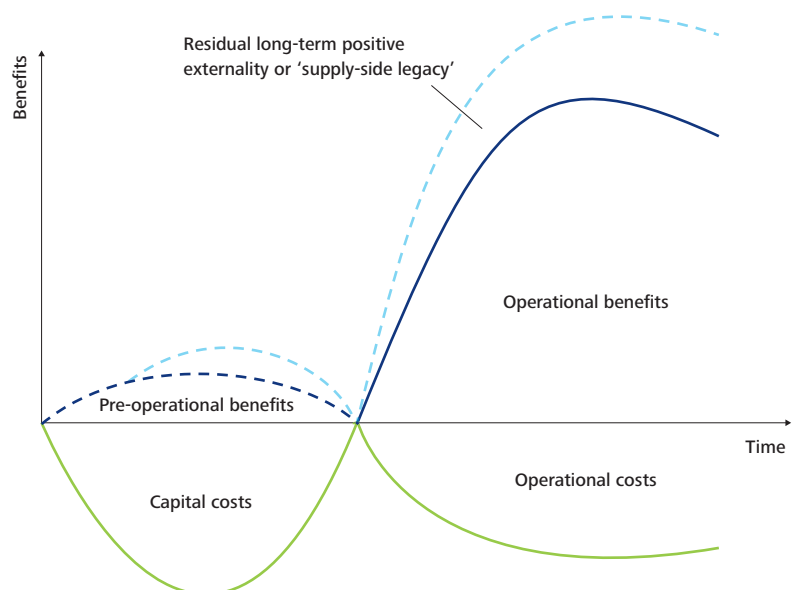
In reality, the impact on the UK economy will depend on the extent to which the programme utilises and develops the UK's industrial capacity, and thus the UK's capability to supply the goods and services required to make major infrastructure projects, such as HS2, operational and successful.

Figure 1 below shows the theoretical timing and relative magnitude of the pre-operational and operational costs and benefits of major infrastructure projects. Whilst the pre-operational benefits are significantly smaller than the operational benefits, they can still be substantial. Figure 1 also indicates that the benefits can be increased by appropriate planning and management (shown by the dashed line) through the residual long-term positive externalities or 'legacy benefits' realised during both construction and operation.

<sup>1</sup> Economist, Metro Systems, January 5th 2013.

<sup>2</sup> The rationale for this is that capital expenditure would have equivalent impacts if it were spent on a different programme or project.

**Figure 1. Potential economic and supply-side legacy impacts from both pre-operational and operational stages of major infrastructure projects (theoretical, not to scale)**



Source: Deloitte analysis

Maximum benefit to the UK occurs if the UK invests in areas where it has, or can have a comparative advantage in the design, construction or manufacture of necessary inputs. These can be put to use after the programme in question – this is the supply-side legacy.

Pre-operational demand-side benefits of global infrastructure investment might be considered as a 'pie' of finite size. The UK will take a proportion of this 'pie', dependent on the capability of the domestic economy to supply the inputs required and the sourcing preferences of the procuring department or organisation.

If the UK develops or sustains comparative advantage locally, and thus expands its 'Production Possibility Frontier', it may be left with a supply-side legacy of knowledge, skills, credentials and capability which can generate further benefits through time on both UK-based projects and as exports to other countries.

This paper contends that the UK should maximise its share of the initial demand-side pre-operational 'pie' and also aim to increase the size of the supply-side legacy effects through judicious and effective management intervention.

The relatively long gestation of major infrastructure programmes means that there is every opportunity to ensure that capital expenditure on design, construction and procurement at the pre-operational stage benefits the UK, both in its own right and in terms of the residual long-term benefits such spending can generate for the future.



3 These indirect and induced benefits capture the 'supply chain' impacts generated. This includes all 'business-to-business' purchases from 'upstream' suppliers in the supply chain (which rely on the direct activity for revenue) as well as all consumer expenditure generated by the remuneration of those employed in the industry. Typically these are not included in HMT analysis, but they will differ by programme depending on the extent to which second, third etc tier sourcing comes from the UK rather than overseas.

4 The analysis covers the pre-operational phase from 2011 to 2027 and is based on information available at the time of analysis.

5 This assumes that the first order supply chain is entirely UK based and that HS2 does not crowd out other investment.

6 When supply chain effects and induced consumer spending are accounted for.

7 As above. This also assumes that the first-order supply chain is UK based and there is no crowding out of investment.

8 Note that this does not take into account the risk of additional leakage by UK firms employing non-UK staff.

# Case study on the maximum potential impacts – design, build and procurement of HS2 Phase 1

HS2 is a good example of a major capital investment programme and an opportunity to reconsider the way in which the pre-operational benefits of major capital investment programmes can be maximised. Much of the public debate regarding HS2 has been based on the operational benefits of the network and the ways in which benefits have been calculated. This focus is undoubtedly appropriate and this paper does not seek to re-cover ground regarding the wider discussion surrounding the merits of the operational phase.

**What is important, though, is the recognition that if the decision to invest is made, the impact of the pre-operational phase on the UK economy can be significant in its own right, and steps can, and should, be taken to maximise these benefits.**

## Background

The Secretary of State has confirmed that HS2 will go ahead. The first phase (London to the West Midlands) is expected to open in 2026 followed by a second phase in 2032-33 connecting the initial phase to Manchester and Leeds, with a further connection to Heathrow.

Following Royal Assent being granted for a Hybrid Bill for HS2, construction on Phase 1 is expected to begin in 2017.

Under a number of scenarios for Phase 1 only, this study uses publicly available information to consider:

- The pre-operational direct benefits of HS2;
- The pre-operational indirect and induced benefits<sup>3</sup> of HS2 through the UK supply chain and through consumer spending impacts; and
- How the pre-operational demand and supply-side benefits of HS2 can be maximised.

## HS2 Phase 1: Summary of pre-operational benefits

Using the first phase of HS2 (London to the West Midlands) as an example, the pre-operational phase of this type of major infrastructure project could generate:<sup>4</sup>



### Maximum economic output benefits in the UK:

- Direct Gross Value Added (GVA) of £4.2bn in total, in 2011 prices, over the period from 2011 to 2027.<sup>5</sup>
- Total (direct, indirect and induced) GVA pre-operational impact could be as high as £14.5bn in 2011 prices.<sup>6</sup>
- As an indicative example, under a scenario where the rolling stock is imported, the total pre-operational impact in GVA terms falls from £14.5bn to £12.0bn.



### Maximum job creation benefits in the UK:

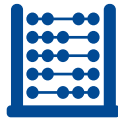
- Direct pre-operational employment impact of around 70,000 person years will be needed to get HS2 online.
- Total (direct, indirect and induced) pre-operational employment impact could be as high as 271,000 person years across the economy.<sup>7</sup>
- Under a scenario where the rolling stock is imported the total pre-operational employment impact falls from 271,000 to 225,000.<sup>8</sup>



### Supply-side legacy effects in the UK:

- The above output and job effects account for the effects during the pre-operational phase of HS2, but the capital accrued during that 15 year period, both physical and human, can have significant legacy benefits that are not estimated here.
- Expertise could also be exported to other countries, e.g. the tunnelling expertise developed in the construction of Crossrail. These legacy effects may require additional 'pump-priming' in the first instance.

## In-depth analysis



### *GVA impacts of the design, build and procurement of HS2, Phase 1*

This section includes analysis of the maximum theoretical impact on Gross Value Added (GVA) contribution.

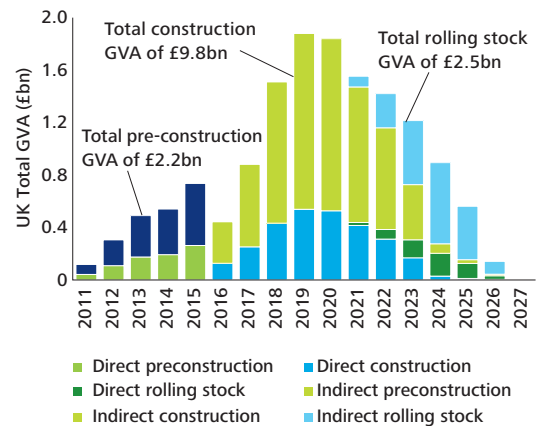
The total GVA contribution presented consists of both direct, indirect, and induced (B-2-B and induced consumer spending impacts) contributions. The GVA impacts are presented under two scenarios where: the first scenario assumes HS2 does not crowd out other investment and all first-order supply chain purchasing is UK based for simplicity; and the second, more likely scenario, is based on leakage of first-order rolling stock supply chain purchases to overseas suppliers.

#### *GVA pre-operational impacts include:*

- **Total pre-operational GVA impact of £14.5bn** in 2011 prices, from 2011 to 2027. This includes the direct, indirect and induced effects and is comprised of:
  - **Direct GVA of £4.2bn** in 2011 prices, with a peak of £500 million in 2019.
  - **Indirect (and induced) GVA of £10.3bn** in 2011 prices.
- The total £14.5bn GVA maximum impact for Phase 1 of HS2 is comprised of the following impacts by each pre-operational stage:
  - **Pre-construction impact of £2.2bn** in 2011 prices, accounting for 15% of the total impact;
  - **Construction impact of £9.8bn** in 2011 prices, accounting for 68% of the total impact; and
  - **Rolling stock impact of £2.5bn** in 2011 prices, accounting for 17% of the total impact.
- **The total GVA impact falls to £12.0bn if rolling stock is imported.** Under this scenario the loss to the UK economy is around £2.5bn.

Figure 2 shows the maximum total impact of HS2 Phase 1 in GVA terms, broken down by each pre-operational phase (pre-construction, construction and rolling stock), as well as the direct and indirect GVA impacts for each of these.

**Figure 2. Maximum total (direct, indirect and induced) impacts on GVA in the pre-operational phase of HS2 Phase 1**



Source: Deloitte analysis, HS2 data<sup>9</sup>, Office for National Statistics (ONS).



### *Employment impacts of the design, build and procurement of HS2 Phase 1*

This section includes analysis of direct, indirect and induced (B-2-B and induced consumer spending) impacts on jobs, on the basis of the scenarios outlined in the previous section. Again, the two scenarios are presented under conditions where:

- Firstly, all first-order supply chain is UK based, with no leakage to overseas suppliers and assumes HS2 does not crowd out other investment, for simplicity; and
- A second, more likely scenario, is based on leakage of first-order supply chain to overseas suppliers through imports of rolling stock.

#### *Employment pre-operational impacts include:*

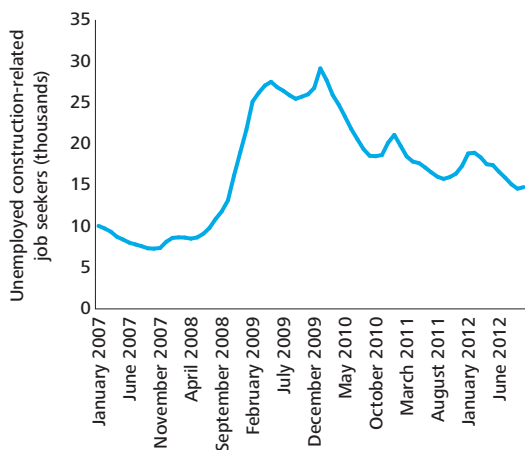
- **Total employment of 271,000 person years** over the period from 2011 to 2027. This total impact includes the direct, indirect and induced effects and is comprised of:
  - **Direct employment of c. 70,000 person years** over the period from 2011 to 2027. This averages out at less than 5,000 per annum over the period; and
  - **Indirect (and induced) employment of 201,000**, over the period from 2011 to 2027, with a peak of 25,600 in 2019.

<sup>9</sup> Cost data was taken from the 'HS2 Cost and Risk Model' published in January 2012. Profiling data was taken from the August 2012 update to the 'Economic Case (HS2 Day 1 and Y costs)'.

- The total 271,000 person years maximum employment impact is comprised of the following impacts for each pre-operational stage:
  - **Pre-construction impact of 42,900**, accounting for 16% of the total impact;
  - **Construction impact of 181,900**, accounting for 67% of the total impact; and
  - **Rolling stock impact of 46,700** in 2011 prices, accounting for 17% of the total impact.

Figure 3 illustrates recent trends in the number of unemployed<sup>10</sup> people seeking work in construction-related jobs<sup>11</sup>. Over the past five years, the average number of unemployed people seeking work in construction-related jobs at a given point in time has been around 17,000. The pre-operational stage of a major infrastructure project such as HS2 could place some unemployed workers in non-specialist jobs and help to enhance their skills. However, the ability to do this will depend on the skills mix and other employment potential factors.

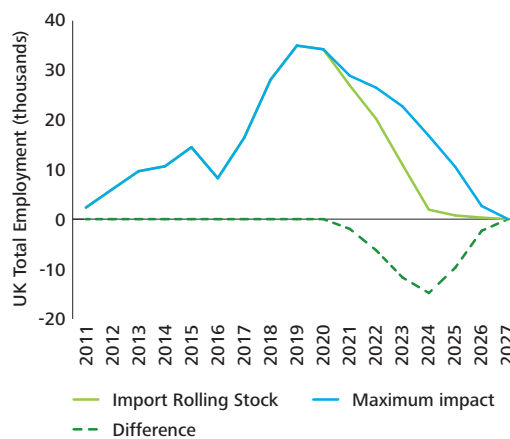
**Figure 3. Unemployed (claimant count) workers seeking jobs in construction-related occupations**



Source: Deloitte analysis, ONS

- The total employment impact falls to 225,000 if the rolling stock is sourced from overseas rather than the UK. Under this scenario, around 47,000 of those person years would be lost to overseas workers and their supply chains.<sup>12</sup>

**Figure 4. Maximum total impact on employment and import rolling stock scenarios in the pre-operational phase of HS2 Phase 1**



Source: Deloitte analysis, HS2 Financial Model, ONS



**Exchequer benefits from design, build and procurement**

The pre-operational phase of HS2 (Phase 1) is likely to generate benefits to the exchequer – particularly if part of the employment impact is created from the UK unemployment pool.

There is an opportunity cost to the exchequer based on those unemployed who could otherwise have been employed, through tax contributions from wages and unemployment benefit payments. However, although not quantified here, this impact is likely to be relatively small next to those presented for GVA contribution across the economy, even if the two should not be readily compared.

<sup>10</sup> Unemployment figures are based on the claimant count measure.

<sup>11</sup> Note: includes the following occupations: managers in construction, construction trades, road construction operatives, rail construction and maintenance operatives, and construction operatives.

<sup>12</sup> Note: figures may not sum due to rounding.

# Maximising the benefits of pre-operational infrastructure projects



The impact of major capital investment programmes is likely to be significant, even without considering the operational benefits of any investment.

The previous section shows that, if the conditions are right, an infrastructure project such as HS2 (Phase 1) could generate as many as 271,000 person years in total over the design, build and procurement phases, contributing nearly £15bn to UK GDP over the pre-operational period to 2027.

Of course, leakage means that not all these jobs are likely to remain in the UK and, if peak year construction coincides with a commercial construction boom, the impact may be a crowding out of other activity in the UK, at least to an extent.<sup>13</sup>

This issue of second-round leakage is beyond policy-makers control, but it is at decision-makers' behest that the direct job and GVA effects can be internalised and kept within the UK – notwithstanding state aid rules. Many countries procure inputs predominantly from their own economies – at least where capability and legislation allows – and therefore the UK should seek to achieve the maximum impacts, where it has an advantage and within the relevant parameters.

**A further rationale for investment in the UK rather than overseas (which is unquantified here) is the prospective improvement to physical and human capital and thus productive capacity over this pre-operational period.** In turn, this has the potential to deliver residual long-term positive externalities or 'legacy benefits' to the UK. The London 2012 case study (right) presents examples of where this has been achieved in the UK and demonstrates that success can be leveraged to ensure these are lasting benefits.

## Case study: Leveraging the success of London 2012

Hundreds of businesses of all sizes tendered for work through the 'Compete for' website. Consequently, around 600 British businesses played a critical role in providing goods and services to the London 2012 Games. This competitive procurement process has also prepared many companies to compete for bigger contracts in future.

The skill and efficiency with which the extremely complex Olympic Games programme was put together provided the British construction industry, together with the supporting cast of programme managers, designers and engineers, with a massive reputational boost which is being marketed internationally.

Furthermore, the highly specialised niche of Olympic bid consultancy shows what is possible in terms of 'exporting skills'. Since London won the right to host the Games, every subsequent Olympic bid winner – Sochi 2014, Rio 2016 and Pyeongchang 2018 – has had UK based consultants in its team of advisers – with it generating significant export revenue in services for the UK.

London 2012 delivered new ways of working and set standards around sustainable construction, SME integration in supply chains, local business engagement and training schemes. This helped to support business, particularly in competition with international rivals, and has been used to benefit British business domestically and internationally.

<sup>13</sup> The analysis in this report assumes no crowding out and therefore presents the maximum theoretical scenario.



Measures that could help to maximise the pre-operational benefits of infrastructure schemes might include:

- **Capitalising on improved workforce skills.**

Training and development of technical and non-technical expertise during the pre-operational phase could help to fill skills gaps and improve capabilities. In turn, this would boost productivity amongst the UK workforce and increase competitiveness. This would leave a lasting impact but the focus of international expertise may shift if overseas competitors' skills develop and they seize future opportunities. The relatively fragmented nature of the UK construction sector may limit the extent to which it can compete with giant competitors from France or Germany on large scale global projects, but there is more that can be done to unlock this opportunity. Also British business does have an advantage it can capitalise on in high value services such as management planning, technical consulting and design, and these are becoming increasingly exportable through the liberalisation of global trade.

An example of the legacy impact through improved workforce skills in action is the Tunnelling and Underground Construction Academy (TUCA) set up as part of Crossrail:

“(TUCA) is a purpose-built training facility that supports the key skills required to work in tunnel excavation, underground construction and infrastructure ... TUCA will support the UK economy by equipping workers with the specialist skills they need to meet the demand for labour in this area.”<sup>14</sup>

- **Developing business operations through R&D and induced innovation in processes, products and services.** Government has identified that the UK excels in research and development, and innovative companies are important contributors to economic growth. Activity during the pre-operational phase of infrastructure projects could generate leading edge innovation by bringing together knowledge, skills and technical resources. Support for this could be provided via Enterprise Hubs, Centres of Excellence, Universities and R&D organisations.

- **Fostering enterprise growth and creation.**

Benefits from the pre-operational phase of projects would not be limited to those directly involved but impacts may be transmitted throughout the supply chain. In order to achieve the maximum benefit, support should be provided through government resources and initiatives such as GOV.UK, providing online business information and tools, and business coaching for growth and business mentors who can offer practical advice to businesses and entrepreneurs. Measures outlined in Government's *Infrastructure Procurement Roadmap*<sup>15</sup> such as early supplier engagement and effective governance should be built on to ensure pre-operational benefits for business are maximised. It is critical for businesses, financial institutions and other government departments to continue to work together to create the optimum environment for UK businesses to start up, grow and succeed.

- **Leveraging export potential.** Experience from the pre-operational phase could generate significant export revenue from application of those skills abroad for similar projects in the future.<sup>16</sup> The UK Government aims to double UK exports to £1 trillion by 2020. The *'Britain Open for Business'* strategy is at the heart of the UK Government's drive to promote growth through trade and investment. There has been significant investment around the world in transit systems and this is set to continue. If the UK develops an even stronger capability in design and structuring during pre-operational phases of infrastructure projects such as HS2, it will prosper in the longer term through greater export potential. However, it will be critical to encourage and assist UK employees and businesses to capitalise on these opportunities. There is the opportunity to attract and leverage inward investment by delivering a coordinated and strong proposition for the UK, marketing it internationally as the knowledge centre for infrastructure projects.

- **Marketing FDI potential.** Foreign direct investment (FDI) in Europe has fallen due to an increasingly competitive climate.<sup>17</sup> A key pathway to growth identified by Government is to target FDI. If the UK is to remain one of the top countries for ease of doing business and attract more inward investment in infrastructure projects, it will be critical to provide investors with the knowledge and information to support and encourage them.

14 <http://www.crossrail.co.uk/delivering/skills-employment/tuca>

15 [http://www.hm-treasury.gov.uk/d/iuk\\_procurement\\_routemap\\_guide\\_to\\_improving\\_delivery\\_capability\\_280113.pdf](http://www.hm-treasury.gov.uk/d/iuk_procurement_routemap_guide_to_improving_delivery_capability_280113.pdf)

16 An example of this is the proposed major industrial corridor "mega-project" in India – see <http://www.ft.com/cms/s/0/f16ce936-79b5-11e2-9015-00144feabd0.html#axzz2LFWT5MWs>

17 FDI Intelligence 2012/13.

# Conclusion

Major infrastructure projects, across all categories, can deliver supply-side benefits in the longer term by increasing productive capacity in the economy.

Enabling infrastructure at the pre-operational phase boosts employment, productivity and thus economic output, as well as developing underlying economic drivers such as skills, innovation, enterprise, investment and competition.

The challenge is in designing and structuring infrastructure projects in a way that optimises the long-term impact for the UK. This means that benefits should remain in the UK if possible (even if that means choosing more expensive inputs) and these benefits should be maximised by supporting the relevant organisations both directly through the expenditure, and indirectly through separate policy measures.

Notable commentators have promoted the repair of existing infrastructure over the development of new infrastructure, as the short-term employment benefits could be achieved more quickly. This is true, however, the longer-term impacts will be greater from new innovative infrastructure projects with lasting positive externality benefits beyond the pre-operational phase.

Where the UK's current capability might allow expansion in future, Government may wish to invest alongside major capital programmes to ensure benefits are maximised. Crucially, this could help to meet the demand for the pre-operational phase of HS2 but will also leave 'legacy benefits' which can fulfil future domestic requirements, generate exports and thus benefit the UK in future.

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