First Interim Evaluation of the Impacts of High Speed 1

Final Report
Volume 1 – Main Report

Plan Design Enable

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Client signoff

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Glossary: Terms and abbreviations used in this report

Term/Abbreviation	Definition
Additionality	An impact arising from an intervention is additional if it would not have occurred in the absence of the intervention.
BCR	Benefit Cost Ratio
Cost Benefit Analysis	Analysis which quantifies in monetary terms as many of the costs and benefits of a proposal as feasible, including items for which the market does not provide a satisfactory measure of economic value.
Deadweight	Expenditure to promote a desired activity that would in fact have occurred without the expenditure.
Discounting	A method used to convert future costs or benefits to present values using a discount rate.
Discount rate	The annual percentage rate at which the present value of a future pound, or other unit of account, is assumed to fall away through time.
Displacement	The degree to which an increase in productive capacity promoted by government policy is offset by reductions in productive capacity elsewhere.
DfT	Department for Transport
Evaluation	Retrospective analysis of a project, programme, or policy to assess how successful or otherwise it has been, and what lessons can be learnt for the future. The terms 'policy evaluation' and 'post-project evaluation' are often used to describe evaluation in those two areas.
External costs or benefits	The non-market impacts of an intervention or activities which are not borne by those who generate them.
Green Book	Official guidance on appraisal and evaluation of spending proposals produced by HM Treasury
Hedonic pricing	Deriving values by decomposing market prices into their constituent characteristics.
HS1	High Speed 1, high speed rail link between London and the Channel Tunnel
HS	High Speed
ITT	Invitation to Tender
Magenta Book	Official guidance on policy evaluation produced by HM Treasury
Market value	The price at which a commodity can be bought or sold, determined through the interaction of buyers and sellers in a market.
Marginal utility	The increase in satisfaction gained by a consumer from a small increase in the consumption of a good or service.
NPV	Net Present Value
PV	Present Value
Sensitivity analysis.	Analysis of the effects on an appraisal of varying the projected values of important variables
Social Benefit	The total increase in the welfare of society from an economic action - the sum of the benefit to the agent performing the action plus the benefit accruing to society as a result of the action.
Social Cost	The total cost to society of an economic activity - the sum of the opportunity costs of the resources used by the agent carrying out the activity, plus any additional costs imposed on society from the activity.
TfL	Transport for London
WebTAG	Web Transport Appraisal Guidance. Guidance on the appraisal of transport projects produced by DfT
WEI	Wider Economic Impacts

Key Findings and Summary

The Approach to Evaluation

High Speed 1 is a high speed rail line connecting London with the Channel Tunnel and onwards to the rail network of continental Europe. It opened to international services in two sections in 2003 and 2007 respectively. In 2009 domestic high speed services were introduced. The line runs from St Pancras in London, via the stations at Stratford, Ebbsfleet and Ashford to the Channel Tunnel.

In 2013 the Department for Transport commissioned this ex post evaluation of HS1. This evaluation was to examine four specific impacts of HS1:

- impacts to transport users and providers;
- wider economic impacts in terms of net effects on economic productivity;
- regeneration impacts in terms of acceleration or increased scale of development and regeneration activity; and
- the impact of HS1 on Governmental shareholdings and asset values.

High Speed 1 will have a useful life of at least 60 years, and will incur costs and deliver benefits over and beyond this period. UK standard appraisal of major transport infrastructure investments of this nature is based on forecasts of their costs and benefits over a 60-year operating period. The full HS1 line to St Pancras opened in November 2007 with domestic high speed services entering operation 2 years later. The period over which the impacts of HS1 can be observed is therefore relatively short, and has coincided with a particularly severe economic downturn that has impacted on underlying levels of rail travel experienced both domestically and internationally.

This ex post evaluation was based on observed data on the capital costs of High Speed 1, its operating costs in its initial years of operation and the response of travellers and businesses to its initial years of operation. However, in order to indicate the potential cost effectiveness of HS1 in the longer term it was necessary to extrapolate these findings into the future in order to estimate the full costs and benefits of High Speed 1 over its useful life. The study should therefore be considered a combination of evaluation, forecasting and appraisal of HS1, with the results of this work enabling actual impacts to be understood and the long term cost effectiveness of the project to be estimated. Consequently, it is considered appropriate to present the findings of this report as representing the **first interim evaluation of the impacts of HS1**, recognising that a substantial element of the findings in the report reflects forecasting and appraisal of impacts to be confirmed in the future. This is in keeping with one of the report's recommendations that evaluation of projects such as HS1 be viewed as a programme of evaluations over time, rather than a singular exercise.

Key Findings from the First Interim Evaluation of HS1 Impacts

HS1 Impacts on Travel Characteristics, Demand, Behaviours and Patterns

The study has observed the impact for and response of travellers to the availability of High Speed 1 and included new primary research to investigate how travellers would have behaved in the absence of High Speed 1.

Impact on Travel characteristics

- **HS1 has had a very significant impact on travel time for rail journeys.** For Eurostar users the total saving is 33 minutes relative to the pre-HS1 route. For domestic rail users the introduction of HS1 domestic services has achieved significant reductions in direct journey times. For instance the routes from Ashford and Ramsgate to London via HS1 are 47 minutes and 49 minutes faster respectively than the Mainline equivalent.

- **The addition of HS1 domestic services has added significant capacity to the network.** The introduction of HS services in peak hours (0700-1000) **represent a 40% addition to the longer distance (i.e. Mainline) peak morning capacity into London from North and East Kent**. Though

it is not possible to definitively distinguish the crowding relief secured by the additional HS services **the net effect of HS1 appears to have been a reduction in average crowding.**

- Detailed data underlying **Network Rail's published data shows HS1 having a positive overall impact in terms of punctuality and reliability of service**, with above average performance being delivered by HS1 domestic services.

- The introduction of a fleet of new service specific trains has improved the perception of the quality of service. The **National Rail Passenger Survey provides evidence that the quality difference is valued by passengers with higher ratings being secured for HS domestic services.**

Impact on Travel Demand, Behaviour and Patterns

- The **demand for HS1 domestic services has grown steadily since implementation at above the average rate for Southeastern and national services**. Demand for HS1 domestic services grew by 20% over the first two years of operation and a further 10% the year thereafter.

- **Demand for services is dominated by journeys into and out of London (80%)** with highest concentrations of journey origins being around Ashford, Canterbury and the Medway Towns. **Ashford has also become a significant railhead** for connection to HS1 domestic services from stations across a wider area.

- **Close to a quarter of HS1 domestic demand can be considered new rail demand.** Trips driving the growth in HS1 demand have been drawn from a number of sources. Passenger surveys examining how passengers would have travelled in the absence of HS1 reported that 77% would have travelled by another train service, 13% would have used alternative modes (primarily car) and 10% would not have travelled, and hence could be considered new trips generated by the opportunities provided by HS1. Survey results suggest that **longer journeys are more likely to be newly generated reflecting the impact HS1 has had on making longer distance commuting and leisure trips to London more feasible.**

- Analysis of **survey responses indicated 18% of respondents had moved house and/or job since 2009, and that HS1 had been a factor in their choice of location.** Though this cannot be taken as conclusive evidence of land use change as a result of HS1, it does give a view on the potential scale of relocation decisions as a result of HS1.

- Eurostar's published quarterly figures on passenger volumes show that **demand for Eurostar services has steadily increased through time, though at a lower level than originally forecast**. **Demand has shown a notable upward step after the implementation of HS1 improvements.**

- **International HS1 demand is dominated by UK boardings and alightings at the London terminal**, with this accounting for over 90% to 95% of the total.

- On average, **just over 70% of international journeys are to or from France**, with the large majority of the remainder travelling to or from Belgium. Business trips account for between 20% and 25% of trips.

- Demand realised for HS1 will have been influenced by the scale of new development in proximity to HS1 stations. The original plans for Ebbsfleet included housing development of 10,000 housing units. However, to date only around 300 have been completed. Assuming one household per housing unit, and 2.3 persons per household (taken from the 2011 Census), and a trip rate of 20 surface rail trips per person per year (taken from the National Travel Survey for the Urban-Rural geographical classification), we estimate that annual demand for HS1 services could have been around 446,000 trips higher if Ebbsfleet had been developed as planned (around 5% of current journeys). More recently, government has announced plans for development of around 16,000 homes at Ebbsfleet.

HS1 Impacts on Transport Users and Providers

The combination of sizeable demand for HS1 enabled services combined with very significant improvements in journey characteristics is forecast to result in the delivery of substantial **transport user and provider benefits over a 60 year operating period, calculated using current HM Treasury and DfT guidance at over £10.2 bn PV (2010 prices)** reflecting:

- Combined international and domestic HS service user travel time benefits of close to £4.7bn PV (2010 prices);

- Additional transport user impacts, including benefits associated with mode shift from car to rail, valued at a further £0.9bn PV (2010 prices);

- Combined additional international and domestic rail revenue of £5.9bn PV (2010 prices); and

- A loss of tax receipts to Government of over £0.8bn PV (2010 prices).

The overall value of benefits is sensitive to the forecasting and appraisal assumptions adopted with the value of **overall impact forecast ranging through sensitivity analysis undertaken from £9.2bn PV to £12.3bn PV (2010 prices).**

Forecast Wider Economic Impacts of HS1

The shorter journey times and greater frequencies of service delivered by HS1 reduces the connectivity and access costs to individuals and firms for making journeys. In the process, the **reductions in effective distances that HS1 delivers bring firms closer to potential customers, employees and partners, giving them access to larger labour and product markets and to a greater range of potential suppliers and partners.** HS1 brings firms the benefits normally associated with being part of a larger denser area of economic activity.

Adopting the DfT's standard approach to the calculation of these impacts, **the net value of these wider economic impacts from HS1 over a 60 year operating period is forecast to be a benefit of over £1.3bn PV (2010 prices),** equating to between 23% and 25% of the value of transport user benefits.

Regeneration Impacts of HS1

Extensive primary research was carried out with businesses and other stakeholders in the areas where HS1 might be expected to lead to economic regeneration. It is clear from this work that:

- **HS1 has contributed to the regeneration of the King's Cross area**;

- **There is also evidence of early stage real estate and regeneration effects in the rest of the HS1 corridor, though these effects could not be considered significant to date**; and

- **Stakeholders expressed confidence that HS1 will influence the development and property market and lead to future regeneration – this had been reflected in adaptation to HS1 in terms of land use plans and policies.**

Our research took place only four years after HS1 became fully operational. The lead times associated with major investment and business location decisions mean that the regeneration effects of HS1 will continue to emerge over the coming years. **The exceptionally adverse conditions in the wider economy and development market since the completion of HS1 will have delayed the emergence of these effects.** In particular, commercial and residential investment and financing for large scale projects will have been adversely affected by frictions in the credit markets.

As we emerge from the recession, prospects are now more apparent as confidence returns and lending activity in support of development and regeneration activity accelerates. **There are significant opportunities to exploit sites with access to HS1 (as can be seen with proposals at Paramount Park adjacent to Ebbsfleet Station) and HS1 can provide a competitive advantage over other areas, although wider factors are likely to be of equal or greater significance.** As travel patterns consolidate there is also further potential to embed patterns of agglomeration as links become established.

HS1 Impact on the Value of Governmental Assets and Shareholdings

The completion of High Speed 1 involved a series of complex transactions involving public and private stakeholders and delivery partners.

The absolute value at 31st March 2013 of the total non-current assets associated with HS1 is estimated to be within the range £3.9bn to £4.1bn. This includes all of the property assets owned by London & Continental Railways (LCR), which are now ultimately owned by the Government, LCR's 40% stake in Eurostar and the freehold on the HS1 infrastructure.

The absolute value at 31st March 2013 of the total net assets associated with HS1 is estimated to be within the range -£219m to -£4.2m. This includes LCR's current assets & current liabilities, but more significantly, the debt originally issued by LCR but subsequently transferred to the DfT. This suggests that the Government is actually holding net liabilities as a result of this project (representing between 0.1% and 6.0% of the non-current assets).

The incremental impact of HS1 alone on the net assets of this portfolio of assets and liabilities is estimated to be within the range -£321m to -£106m. This suggests that relative to a scenario where the HS1 project had not been pursued, the Government incurred incremental net liabilities. This represents the net cost as a consequence of HS1 to the exchequer of the significant benefits provided to travellers and the economy as a whole by HS1, and we note that these are relatively modest with respect to the overall investment and the impacts that the project has generated.

Cost Effectiveness of HS1

As part of the study the costs for HS1 identified by the NAO in 2012 were reviewed. The primary addition to the costs was the cost of undertaking expansion of King's Cross St Pancras Underground Station to accommodate new HS1 demand net of the cost of planned works that would have been undertaken to address congestion at the station in any case. **The outturn capital cost of construction of HS1 works inclusive of the Underground works has been estimated at £6.84bn.**

However, the project has been subject to complex financing arrangements and has been through a process of restructuring and sale. **The actual outturn costs incurred to 2010 associated with delivery, restructuring and sale of HS1 infrastructure is estimated to be £3.36bn plus a further net cost of £0.68bn to 2014 for the associated King's Cross St Pancras Underground works**. In addition to this amount, **there is an outstanding value of project debt repayments and interest to be accounted for that is estimated at £4.8bn PV at 2010 prices.**

The **annual operating costs associated with HS1, inclusive of all charges associated with the operating regime established for the projects, are estimated at £240m at 2013 prices.**

The comparison of estimated monetary values of the costs and benefits of the scheme over the appraisal period provides a central case BCR of less than 1 (0.53 without WEI and 0.64 with WEI). This indicates that monetised benefits do not fully cover scheme costs over the appraisal period with the PVC of £12.60bn and PVB of £6.70bn (without WEI) or £8.03bn (with WEI) generating a NPV of -£5.90bn (without WEI) or -£4.57bn (including WEI).

However the sensitivity tests undertaken also show that the results are sensitive to a range of assumptions with potentially significant impacts on results. Key influences include the assumption on subsidy and assumptions on values of time (and purpose split) and demand growth. Given the uncertainty in the forecasts of future performance, it is possible to envisage reasonable changes relative to existing assumptions even for individual variables which would lead to a BCR of 1. Examples of changes that would achieve a BCR or 1 include avoiding the need for ongoing DfT subsidy to HS domestic services, a 50% increase in the value of domestic and international user benefits and revenue over the appraisal period or an increase in the proportion of passengers that are travelling for business or other purposes with high values of time to about 75% (from the current 20% to 22%).

Additionally, the sensitivity tests identified are not mutually exclusive and it is possible to envisage future scenarios in which several of the identified changes with either a positive or negative impact on the economic case for HS1 occur simultaneously, with larger cumulative impacts on the BCR than those identified in the table above for individual tests. As an example, a lower and upper range test, combining pessimistic and optimistic assumptions on rates and duration of demand growth and proportions of business travellers, resulted in BCRs ranging between 0.4 and 1.2 (with WEI). It is important to note that these values represent an illustration of the cumulative impacts of a combination of pessimistic or optimistic assumptions in relation to future scenarios. They do not reflect minimum and maximum possible values of the BCR. However, the size of the range highlights the importance of the assumptions made in relation to certain key future variables, particularly when possible variations are considered cumulatively.

As was previously noted, government has recently announced plans to support the delivery of 16,000 new homes at Ebbsfleet. We have not estimated the impact on the economic case of this announcement, given uncertainty in timing, the amount of government support that will be needed, and how the rule of a half should be applied.

Lessons for Future Project Evaluations

A number of lessons for future evaluation work can be drawn from this study.

The costs and impacts of a very large scale infrastructure and service intervention such as HS1 will be determined over a considerable period of time. Consequently, ex post evaluation of such schemes should be considered as an on-going programme of evaluation rather than a one-off exercise, supported by a complementary programme of monitoring and data collection. It should also be recognised that, as has been the case with HS1, early stage evaluation will inevitably combine capturing and monitoring of actual impacts with re-forecasting and re-appraisal of future impacts, particularly where an understanding of the potential for pre-scheme implementation estimates or forecasts of costs, demand, revenues or benefits is to form part of the evaluation. **The degree of uncertainty over evaluation findings when undertaken early in a project's operating period should also be recognised. A programme approach to evaluation can ensure that evaluation at any given time can be focused on areas where legitimate and meaningful findings and outcomes can be determined.**

In addition, **comprehensive planning for a process of ex post evaluation in advance of an investment decision being made would greatly facilitate such evaluations.** This should be incorporated into the process of business case preparation and presentation during scheme development phases in line with the HM Treasury guidance, and form an integral part of the Management Case therein. The lack of planned and programmed evaluation regime in the case of HS1 has posed significant challenges due a lack of targeted and evaluation focused data to draw on. There have also been significant gaps in historical information and documentation. In this respect**, it is vital that the assumptions and detailed analysis associated with business cases, associated with investment and delivery decisions are documented comprehensively and that this information is retained for future reference to support ex post evaluation in later years.**

The evaluation plan and programme itself should be developed in line with HM Treasury's Magenta Book guidance and as such capture the Logic Mapping of potential outcomes and the route to them being realised that will be the focus of the evaluation. This Logic Mapping process will capture both the with intervention and counterfactual scenarios and require their clear definition. This is important to ensure that **any divergence post opening from the assumed scenarios can be clearly identified, and this may be critical to understanding why scheme performance and outcomes do not match prior expectations.**

Further lessons drawn from the HS1 evaluation particularly pertinent to major rail scheme evaluation have been:

- the importance of **expressly defining the intervention and counterfactual infrastructure and service specifications at the time that the investment decision is made**. This would allow clear attribution of the effects of the intervention for future evaluations;

- the need **to identify and define control / benchmark corridors or locations in advance and ensuring that data collection and monitoring regimes are in place for these** as well as the area associated with the intervention;

- the need to undertake **baseline transport user and stakeholder surveys to assist future evaluation of travel and economic activity and behaviour,** to enable as far as possible analysis to be based on observed rather than stated behaviour; and

- **establish contractual obligations for operators and infrastructure providers to gather and disclose relevant data for the purposes of evaluation** to avoid difficulties in securing this information at the time of evaluation.

1. Introduction and Terms of Reference for this study

1.1. Background and Terms of Reference

High Speed 1 is a high speed rail line connecting London with the Channel Tunnel and onwards to the rail network of continental Europe. It opened to international services in two sections in 2003 and 2007 respectively. In 2009 domestic high speed services were introduced. The line runs from St Pancras in London, via the stations at Stratford, Ebbsfleet and Ashford to the Channel Tunnel.

In 2013 the Department for Transport commissioned an ex post evaluation of HS1. This evaluation was to comply with the general requirements for evaluation of transport investment projects, specifically the Green Book and the Magenta Book. The study carried out was to analyse and evaluate the impacts of HS1 and assess its outturn cost effectiveness.

The evaluation was to include four specific impacts of HS1:

- Transport user benefits;
- The wider economic impacts;
- Regeneration benefits; and
- The impact of HS1 on Departmental shareholdings and asset values.

In addition the evaluation was to examine the cost effectiveness of HS1 drawing on the evaluation of the impacts above and details of the costs associated with the project.

HS1 is used by domestic and international passengers and can affect their journey times and the reliability of the transport service they receive. As it represents additional capacity it can also reduce crowding on other domestic services, and can affect the services received by users of the rest of the rail network in the South East.

A project of this scale also has the potential to give rise to benefits for the wider economy which would be in addition to the benefits for transport users. These consist of:

- Agglomeration benefits where improved transport services lead to increased productivity in the production of other goods and services;
- Labour market benefits where improved transport services attract additional members of the labour force and allow those in work to move to more productive jobs; and
- Imperfect competition impacts where reductions in the transport costs of businesses operating in imperfectly competitive markets leads to them increasing their output.

Regeneration benefits were an important element in the case for investing in HS1. HS1 was expected to have regeneration effects in the areas around St Pancras, Stratford, Ebbsfleet, Ashford and North and East Kent. The availability of this improved transport could influence the investment and output decisions of firms and so have positive effects on employment, rents, property values and economic activity in these areas. These impacts would be the result of a diversion of economic activity to these areas and away from the locations where it would take place in the counterfactual. As a result these regeneration benefits do not represent a net benefit to the economy as a whole and are not typically included in a cost benefit calculation. However to the extent that they contribute to the development of underdeveloped areas and improve the opportunities available to their residents they are an important contribution to public policy.

The construction and operation of HS1 was the result of a number of complex transactions involving the public and private sector. These included two occasions where the government restructured the ongoing project in 1998 and 2002 respectively. This element of the evaluation amounted to isolating the net effect of the transactions leading to the completion of HS1 on the assets and liabilities of central government i.e. what was the total cost of the process leading to the completion of HS1 to central government and what was the value of the assets in government ownership at the end of the process. This exercise amounts to a sub-set

of a conventional cost benefit assessment which captures the full effect of such an investment on the government and private sector and the public at large.

1.2. Defining the Scope of Evaluation

HS1 is a large and complex investment in transport infrastructure so careful specification of what was being evaluated and the counterfactual with which it should be compared was an essential first step in this evaluation. The reasoning adopted and the results of this step are set out in detail in the evaluation scoping report prepared early in the study. This scoping report is attached to this report as Appendix A.

The HS1 Scheme was defined to include:

- A new 109km high speed line connecting St Pancras International in London to the Channel Tunnel at Ashford in Kent (Section 1 opened September 2003; Section 2 opened November 2007);

- New / improved high quality station environments at St Pancras, Stratford, Ebbsfleet, and Ashford, with additional parking and retail provision;

- Re-routing of Eurostar services to the Continent via the new high speed line, instead of utilising existing routes from Waterloo to the Channel Tunnel. This includes an additional stop at Ebbsfleet; and relocation of the international London Eurostar terminus from Waterloo to St Pancras;

- Domestic high speed trains (Class 395) and high speed services to North and East Kent, with associated premium fares;

- A major revision of the Southeastern timetable (December 2009) relating to the classic network (Mainline and Metro Services), and increased fares across the Southeastern network; and

- New high speed rail freight capacity between London and North and South Kent.

As the main aim of this evaluation was to measure the value for money of the investment in HS1 the counterfactual was defined as a hypothetical scenario where no alternative investment to HS1 was made to deliver the objectives for the scheme. This counterfactual was developed for the purposes of this evaluation, and does not necessarily correspond to the counterfactual as understood when the decision to invest in High Speed 1 was made. It has been applied consistently to the assessment of Transport User Benefits, Wider Economic Impacts and Regeneration Benefits. This could be considered an unrealistic assumption; however it was adopted to ensure that the evaluation included the full costs and benefits of HS1. If the assumption had been made that some "do minimum" type investment would have been made in rail capacity along the corridor served by HS1 then the costs taken into account would have been reduced by the cost of this alternative investment, and the benefits taken into account would have been reduced by the benefit of this hypothetical alternative to HS1.

1.3. Overall Approach

The approach adopted in this study is described in detail in the Scoping Report presented in Appendix A. The approach adopted is summarised in Figure 1.1 below and has four key phases:

- A review of the scope and approach to be adopted for the evaluation including logic mapping and scenario definition;

- An analysis phase that established the tools and data necessary to evaluate the impact of HS1 and derive the impacts either quantitatively or qualitatively;

- An estimation of the outturn cost-effectiveness and value for money performance of HS1 including the estimation of costs and the calculation of an NPV and BCR for HS1; and

- A comparison with forecast impacts covering impacts in all categories.

Figure 1.1: Summary of Approach to the Evaluation of HS1 Impacts
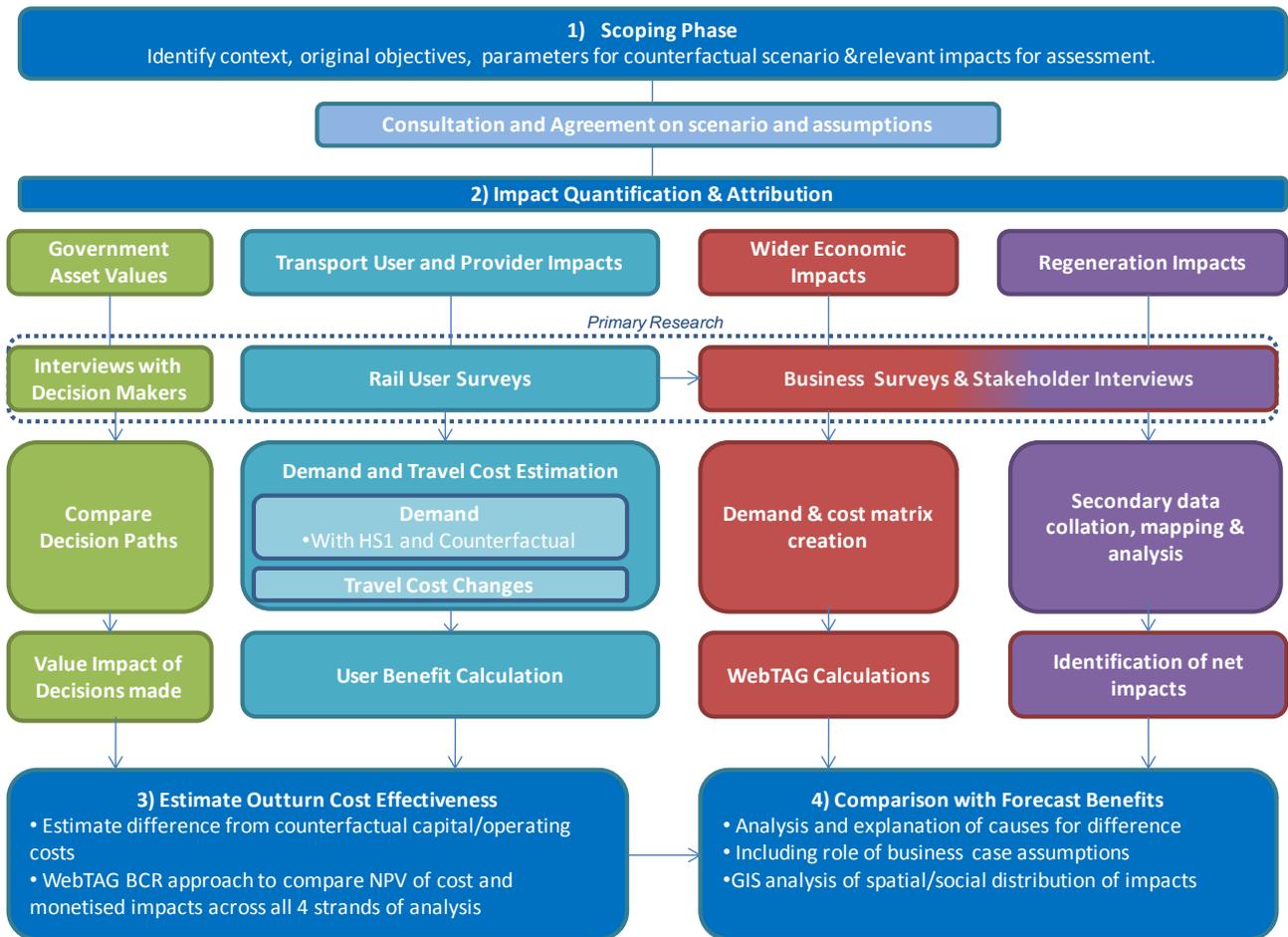
High Speed 1 will have a useful life of at least 60 years, and will incur costs and deliver benefits over this period. The appraisal of transport infrastructure investments is based on forecasts of their costs and benefits over a full 60 year useful life. This ex post evaluation was based on observed data on the capital costs of High Speed 1, its operating costs in its initial years of operation and the response of travellers and businesses to its initial years of operation. However, it was necessary to extrapolate these findings into the future in order to estimate the full costs and benefits of High Speed 1 over its useful life. The evaluation therefore required the use of techniques normally associated with appraisal. The results of this work were used to investigate the cost effectiveness of the project.

With respect to phase 4, significant effort was made to secure details of previous forecasting of benefits and the original business case, but unfortunately these details have not been available. Consequently this element of the study has not been progressed as originally planned and does not form part of the final reporting presented here.

1.4. Structure of Report

The remainder of this report is set out as follows:

- Section 2 sets out the results of the work on transport user, non-user and revenue impacts of HS1;

- Section 3 describes and quantifies the Wider Economic Impacts of HS1;

- Section 4 describes the regeneration impacts of HS1;

- Section 5 identifies the net impacts of HS1 on government shareholdings and asset values; and

- Section 6 draws together the relevant benefits and costs of HS1 as identified on this study and assesses the cost effectiveness of the project.

A separate volume of appendices contains the following reports prepared during the course of this study:

- Evaluation scoping report;
- Methodology report for the on-train surveys;
- Assumptions and economic data report;
- Business interviews report;
- Stakeholder interviews report; and
- Secondary data analysis report.

2. Transport User, Non User and Revenue Impacts

2.1. Overview

This chapter provides an overview of the estimated impacts of the introduction of HS1 and associated timetable changes on:

- rail users - through impacts on travel times and costs;

- road users - through decongestion benefits due to mode switch from car to rail;

- non users - through externality impacts such as changes in noise and emissions; and

- transport operators/providers - through revenue impacts only (costs are considered in Chapter 6).

The analysis is intended to provide an understanding of the relative scale of the different impacts and to contribute to an assessment of the cost effectiveness of the scheme. Government guidance (in the HM Treasury Green Book[1] and WebTAG[2]) suggests that the impacts of transport schemes should be appraised over a 60 year time period. As HS1 has enabled High Speed (HS) domestic services for four years and reduced journey times on international Eurostar services for ten years, there is a need to forecast impacts over the remainder of the assessment period to 2069[3]. The assessment is therefore part evaluation, considering existing impacts of the scheme as observed to date (between 2003[4] and 2013), and part appraisal, forecasting likely future impacts over the remainder of the appraisal period (from 2014 to 2069).

The chapter consists of eleven further sections which summarise in turn:

- the **context of the assessment**, including the logic map devised to inform the development of the evaluation methodology;

- the **approach adopted** for undertaking the evaluation/appraisal, summarising the more detailed information provided in the Scoping Note for the study[5] (attached as Appendix 1);

- the **current impacts of HS1** and associated timetable changes and usage levels (i.e. underpinning the evaluation element of the assessment, considering observed impacts);

- the **forecast impacts of HS1** and associated timetable changes over the remainder of the 60 year appraisal period (contributing to the appraisal element of the assessment, considering forecast future impacts);

- the **monetary value of user benefits** caused by HS1 and associated timetable changes over the whole appraisal period, based on observed and forecast impacts and standard government guidance on appraisal procedure;

- the **scale of non-user benefits** caused by HS1 and associated timetable changes; including the impacts of externalities such as noise and air quality relief;

- the **scale of the revenue impacts** of HS1 and associated timetable changes;

- **overall quantified impacts** in the context of wider WebTAG considerations;

- the **outcomes of sensitivity tests** undertaken to assess the impacts of varying key assumptions on the overall assessment results;

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[1] HM Treasury The Green Book: Appraisal and Evaluation in Central Government
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/220541/green_book_complete.pdf

[2] WebTAG: Transport Analysis Guidance: https://www.gov.uk/transport-analysis-guidance-webtag

[3] In line with guidance, the appraisal period is taken as 60 years from the start of the 'full scheme' i.e. provision of domestic HS services as well as improvements to Eurostar services. The appraisal period therefore ends in 2069, including 66 years of impacts of altered Eurostar services.

[4] Phase 1 of HS1 from the Channel Tunnel to Fawkham Junction opened in September 2003, therefore the appraisal period includes the last quarter of 2003.

[5] Evaluation of the Impacts of High Speed 1, Evaluation Scoping Note, June 2013

- the **potential scale of feedback effects** from regeneration effects (described in Chapter 4) to user benefits; and

- the **overall findings**.

2.2. Context and Logic Map

The impacts addressed in this Chapter relate primarily to the effects of HS1 and associated Eurostar and Southeastern timetable changes on travel patterns and volumes and the resultant impacts experienced by transport users, non-users and transport providers.

For the purposes of this analysis, 'transport users' are defined as those people (whether based in the UK or overseas) making journeys on elements of the UK transport network that are materially affected by the introduction of HS1. This includes users of the High Speed network itself (including Eurostar passengers) and users of other public transport services and the local and strategic road network in Kent.

HS1 has had a range of impacts, some positive and some negative, distributed across a range of categories of transport users and providers and other members of society. The evaluation/appraisal has sought to identify the significant impacts without double counting, providing quantification where possible.

Figure 2.1 shows the logic map derived at the beginning of the evaluation process by applying the theory of change to provide a structured approach to identifying potential impacts and consequences of HS1. It was produced to help ensure that all material effects were captured and was developed through a structured process of identifying:

- **Outputs** - the changes which have arisen as a result of the HS1 scheme, including a change in rail supply which led to an overall change in generalised cost of travel for passengers (e.g. through changes in journey time, frequency of service, reliability, crowding relief and travel costs);

- **Outcomes** - the range of benefits and impacts which have resulted from the outputs (e.g. passenger user benefits and revenue); and

- **Processes** - intermediate steps by which the outcomes have occurred.

Figure 2.1: Transport User and Provider Impacts Logic Map

INTERVENTION: HS1 SCHEME

- New 109km high speed line connecting St Pancras International in London to the Channel Tunnel at Ashford in Kent (Section 1 opened Sep 2003; Section 2 opened Nov 2007).
- High quality station environments at St Pancras, Stratford (7 mins), Ebbsfleet (17 mins), and Ashford (37 mins), with additional parking and retail provision.
- Eurostar high speed trains and services to the continent; domestic high speed trains (Class 395) and high speed services to Kent; domestic high speed premium fares and slightly higher fares on other Southeastern services (linked to overall improvement in reliability across the Southeastern network).
- Relocation of international London Eurostar terminus from Waterloo to St Pancras.

Eurostar high speed services:
- **St Pancras - Ebbsfleet - Ashford**
- **Calais - Lille - Paris or Brussels**
- Limited services to Disneyland Paris and to seasonal destinations in southern France.

New high speed services (HS sections in bold):
- St Pancras - **Stratford - Ebbsfleet - Ashford** - Canterbury West - Ramsgate - Broadstairs - Margate (1 tph in AM peak)
- St Pancras - **Stratford - Ebbsfleet - Ashford** - Folkestone West / Central - Dover Priory (1 tph in AM peak)
- St Pancras - **Stratford - Ebbsfleet** - Gravesend - Strood - Rochester - Chatham - Gillingham - Rainham - Sittingbourne - Faversham (2 tph in AM peak)
- St Pancras - **Stratford - Ebbsfleet** - Gravesend - Strood - Rochester - Chatham - Gillingham - Rainham - Sittingbourne - Faversham - Whitstable - Herne Bay - Birchington-on-Sea - Margate - Broadstairs (peak only)
- St Pancras - **Stratford - Ebbsfleet** - Gravesend - Strood - Maidstone West (peak only)

Major revision of Southeastern timetable (Dec 2009) - Mainline and Metro services.

Lower spec trains retained - Class 375 Electrostar, top speed 100mph on Mainlines; Metro-style trains, top speed 75 mph on Metro lines.

High speed rail freight capacity between London and Kent

OUTPUT: CHANGE IN SUPPLY

A. Eurostar Market

Shorter journey times for international Eurostar journeys - London to Paris journey time cut by 20 mins following completion of Section 2 of HS1.

D. Thameslink, Other

Increased capacity around Herne Hill (former Eurostar route to Waterloo). Improvements to Thameslink services. The capacity released at Herne Hill allowed the network to cater for services diverted from London Bridge during the construction of Thameslink.

Increased capacity at Waterloo Station (former Eurostar terminus) - Allowing potential for platform and train lengthening for SW Trains.

B. Domestic High Speed Market (Southeastern)

Improved service provision between London and Stratford - More frequent services, significantly faster and direct journey times (up to 25 min saving), improved reliability and reduced crowding, but with higher fares.

Improved access to East London, via DLR.

Improved service provision between London / Stratford and stations in Kent served by HS services - More frequent services, significantly faster and direct journey times, improved reliability and reduced crowding, but with higher fares:
- Ebbsfleet (up to 33 min saving),
- Ashford (up to 47 min saving),
- Folkestone (up to 44 min saving),
- Dover Priory (up to 47 mins saving),
- Canterbury West (up to 49 mins saving),
- Ramsgate (up to 49 mins saving),
- Gravesend (up to 35 mins saving),
- Strood (up to 33 mins saving),
- Gillingham (up to 35 mins saving),
- and other stations in Kent: Rochester, Chatham, Rainham, Sittingbourne, Faversham, Whitstable, Herne Bay, Birchington-on-Sea, Broadstairs, Margate (smaller jt savings).

Improved service provision between London / Stratford and other London Terminii, involving an interchange on to high speed services at St Pancras or Stratford - More frequent services, significantly faster journey times, improved reliability and reduced crowding, but with higher fares:
- London Victoria -Tube to St Pancras - Highspeed services to stations in Kent served by high speed services (c. 25 min saving to Ashford).
- Charing Cross -Tube to Stratford - Highspeed services to stations in Kent served by high speed services (c. 25 min saving to Ashford).
- London Bridge -Tube to Stratford - Highspeed services to stations in Kent served by high speed services (c. 25 min saving to Ashford).

C. Domestic Non-High Speed Market (Southeastern)

Reduction in service frequency, fewer limited-stop services, some services axed.

Mainlines affected:
- Ashford Line (London Bridge / Cannon St, Charing Cross, Sevenoaks, Ashford, Ramsgate)
- Maidstone East Line (London Victoria, Maidstone East, Ashford)
- Chatham Line (Victoria and London Bridge / Cannon Street to Ramsgate and Dover).

Metro lines affected:
- Greenwich Line, Bexley Heath Line, and Sidcup Line.

E. Freight

Change in supply: Overall reduction in generalised cost (time) on international services.

Change in supply: Overall reduction in generalised cost for Thameslink users routed via Herne Hill.

Change in supply: Overall reduction in generalised cost (freq/journey time/reliability and crowding) for business, commuter and leisure travel between St Pancras, Stratford, and stations in Kent served by high speed services, offset by higher fares.

Change in supply: Overall reduction in generalised cost for travel between other London Terminii (Victoria, Charing Cross, London Bridge, Cannon St) and stations in Kent served by high speed services, offset by higher fares.

Change in supply: Overall increase in generalised cost (freq/time/reliability and crowding/cost) for services from stations not served by high speed.

OUTCOME: CHANGE IN DEMAND

Increases attractiveness of travel to existing destinations.

Increases attractiveness of travel to existing destinations.

Increases attractiveness of travel to existing destinations / attractions.

Increases attractiveness of travel to existing destinations.

Decreases attractiveness of travel to existing destinations.

Overall increase in international passenger numbers:
- New generated trips
- Mode shift from air and ferry

Overall increase in Thameslink passenger numbers:
- New generated trips

Change in demand: Generated trips on HS1 services
- New rail trips between St Pancras, Stratford, and stations in Kent generated, predominantly amongst passengers with a generally higher value of time.
Change in demand: Existing (pre HS1) trips to/from stations in Kent now served by high speed services
- Net transfer from conventional to high speed services amongst passengers with a higher value of time; reduction in passengers with a generally higher value of time on non-HS Mainline services.
- Continued use of non-HS Mainline services amongst some passengers with a generally lower value of time.
Change in demand: Existing (pre HS1) trips to/from stations in Outer London and Kent not served by high speed services
- Some transfer to 'park and high speed rail' from stations which are served by HS1 services (for inbound trips) or 'high speed rail and taxi' (for outbound trips), amongst passengers with a generally higher value of time.
- Continued use of non-HS Mainline services amongst some passengers with a generally lower value of time.
- Some trip suppression as a result of the overall reduction in service provision, i.e. passengers choose not to make trip, change their destination, and/or switch to non-rail modes.
Overall change in demand
- Significant increase in rail trips between St Pancras, Stratford, and Kent (predominantly on high speed services, and involving passengers with a generally higher value of time).
- Some reduction in passengers using non-HS Mainline and Metro services.

FEEDBACK LOOP

Change in land-use / Increase in employment opportunities and commuter and business travel associated with Wider Economic and Regeneration Impacts.

Generates additional trip demand, above that derived purely from change in supply / generalised cost.

OUTCOME: TRANSPORT USER AND PROVIDER IMPACTS

Net user benefits for international HS rail users
- Net reduction in journey time (Pax-Hrs)

Net user benefits for Thameslink rail users
- Net reduction in journey time (Pax-Hrs)
- Net reduction in journey time (Pax-Hrs), reliability and over-crowding (Pax-£s)

Net user benefits for HS rail users / Operator revenue benefits
- Net increase in patronage
- Net reduction in journey time (Pax-Hrs)
- Net improvement in reliability, over-crowding, and quality (Pax-£s)
- Offset by net increase in fares (Pax-£s)

Net user dis-benefits for non-HS rail users / Operator revenue dis-benefits
- Net impact of reduced service frequency, fares, crowding levels.
- Some reduction in patronage.

Net user benefits for other London public transport users
- Including station quality benefits, net impact of re-distribution of underground demand and crowding.

Change in arrivals / departures from London Termini:
- More rail passengers at St Pancras International and Stratford International.
- Fewer rail passengers at Victoria, Charing Cross, London Bridge, Cannon Street.

Increase in passengers at other HS1 stations.

Change in use of Underground Stations and Lines:
- Greater use of St Pancras / Kings X Underground.
- More Underground trips between St Pancras / Kings X and other London Termini Underground Stations (by pax switching from Mainline Services.

Greater use of DLR:
- Related to new generated trips.

Change in car use and parking:
- Generated HS1 trips: Reduction in car-kms amongst new HS rail users, who no longer drive to alternative destination. Increased parking at HS stations (e.g. 5,000 new parking spaces at Ebbsfleet).
- Existing (pre HS1) trips to/from stations in Kent not served by high speed services: Longer driving distances to access stations served by high speed, and potential mode switch away from rail, driven by increased fares, reduced frequency and fewer limited stop services non-HS Mainline services. Less parking at local stations not served by HS services.
- Park & Bus / Coach trips: Mode shift from car + some new generated trips. Increased parking at

Change in traffic, congestion, environmental and well-being externalities:
- Reduction in traffic, associated congestion and environmental / well-being externalities on routes parrallel to improved rail corridors.
- Increase in traffic, associated congestion and environmental / well-being externalities on localised routes to stations (e.g. near stations such as Ebbsfleet attracting park and rail / rail and taxi).
- Reduction in HGV traffic on strategic network in Kent and associated congestion and other externalities.
- Net change in car and HGV user benefits (journey time and vehicle operating costs).

Increase in parking revenue - Net result of increase at HS stations and decrease at local stations not served by HS routes.

Rail freight operating cost savings

WIDER ECONOMIC IMPACTS

REGENERATION IMPACTS

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The overarching form of the logic map has remained relevant throughout the study and provided the framework for analysis. However, evidence and understanding gained during the study have altered the relative emphasis applied to some of the issues identified in the map. They have also necessitated the aggregation of some of the impacts identified separately in the map to reflect the availability of data or likely scale of impact. The table below summarises the correspondence between the outcomes presented in the logic map and the form of the assessment results presented later in the chapter (Tables 2.7 to 2.11).

Table 2.1: Correspondence between Logic Map Outcomes and Assessment Results

Logic Map Outcome	Representation in assessment (Table 2.7 to Table 2.11)	Comment
A) Eurostar Market		
Net user benefits for international HS rail users	Covered in estimate of international time savings	No user charge impacts as no impacts on fares
Revenue impacts	Covered in estimate of international revenue	
B) and C) Domestic High Speed Market and Domestic Non-High Speed Market (Southeastern)		
User benefits for HS rail users	Primary/secondary user journey time savings and user charge impacts and overall crowding, reliability and quality benefits	*Primary* = benefit for journeys solely on HS1, *Secondary* = benefits for journeys using HS1 for part of journey *Indirect* = benefits for Southeastern journeys not using HS1 but using services affected by the timetable changes associated with HS1 (described further in section 2.4.1.1) Benefits were calculated on the basis of MOIRA ticketing and timetable based data which accounts for relevant changes in services and demand across the whole Southeastern network and therefore covers all services listed under '*Change in Supply Output*' in the logic map. However, MOIRA output information is provided by journey origin and destination, meaning that presenting benefits separately for each service would have required a range of assumptions to be made on routing and allocation of benefits to service which would have added uncertainty to results. The approach adopted was therefore to present results disaggregated into Primary, Secondary and Indirect categories, based on a set of assumptions used to allocate benefits between services at this broader level, supported by additional information on distribution of benefits by origin station.
User benefits of non-HS rail users	Indirect user journey time savings, user charge impacts and crowding benefits	
HS and Non HS rail user revenue	Covered in estimate of domestic revenue	
Net user benefits for other London public transport users	Net effect assumed to be negligible	Benefits likely in some areas and disbenefits in others, changes very difficult to disaggregate from other larger influences on public transport in London over the same time frame

Logic Map Outcome	Representation in assessment (Table 2.7 to Table 2.11)	Comment
Change in arrivals/departures from London termini	Incorporated in estimate of primary/secondary/indirect domestic user benefits.	Benefits calculated using MOIRA data which accounts for full journey, including onward travel from Southeastern network
Change in use of Underground Stations and Lines		
Greater use of DLR		
Change in car use, parking, traffic, congestion, environmental and well-being externalities	Covered in estimates of - road time saving benefits, - road safety impacts and - environmental externalities	
D) Thameslink, Other		
	Covered in qualitative commentary	Research suggested impacts were uncertain and likely to be relatively minor
E) Freight		
	Covered in qualitative commentary	Impacts are minor and no commonly agreed approach to assessment exists

The evaluation/appraisal approach developed within this framework has been designed to be consistent with the DfT's WebTAG documentation. This includes use of appropriate parameters such as values of time and application of a proportionate approach, focusing particularly on the impacts considered most significant.

The material impacts are set out in Figure 2.2 with the colour key identifying those that have been attributed a monetary value and those that have been addressed qualitatively. Those impacts scoped out of the quantitative assessment are the more minor impacts. There is typically inherent uncertainty over their scale and the extent to which they can be considered attributable to HS1, meaning that they would have been disproportionately time consuming to identify in greater detail. Further detail on the reasoning behind the scoping process is provided in the Scoping Note (attached as Appendix 1).

Figure 2.2: User, Non User and Revenue Related Impacts of HS1

User, Non User & Revenue Related Benefits and Disbenefits related to HS1		Impact Groups					
		A	B	C	D	E	F
Benefit Groups		International Passengers	Domestic Southeastern HS Passengers	Domestic Southeastern Non HS Passengers	Road Users	Rest of Society	Transport Providers*
1) User Benefits *(by journey purpose: business, commuting & other)*							
A) Journey time	In vehicle time						
	Interchange/wait time/frequency						
	Station access/egress cost/time						
B) Reliability							
C) Crowding							
D) Journey Quality	Train and station						
E) User Charges	Fares						
	Parking charges						
F) Safety (Transport accidents)							
2) Operator Incomes							
A) Revenue							
3) Environmental Externalities of Transport Use and Operation							
A) Carbon							
B) Noise							
C) Air quality							

*Eurostar & Southeastern

Key

- Likely to be significant impact (positive or negative), assessed quantitatively
- Moderate and/or uncertain impact, assessed quantitatively
- Minor impact, assessed qualitatively
- Not applicable

2.3. Summary of Approach

As outlined above, the Scoping Note for the study provides a detailed explanation of the approach adopted to estimate user, non-user and revenue impacts. The Note was initially written at the start of the study but was kept up to date to reflect adjustments to the approach, made in response to additional knowledge acquired on data availability and content.

In summary, an assessment of the net present value of the impacts of HS1 and associated timetable changes over an appraisal period to 2069 has been undertaken. It is consistent with government guidance on transport appraisal and drew particularly on the DfT's WebTAG documentation and the rail industry's Passenger Demand Forecasting Handbook.[6] As discussed above, the assessment is a combination of evaluation (i.e. attribution of a value to observed impacts to date) and appraisal (attribution of a value to forecast future impacts of HS1).

A significant proportion of the quantitative analysis revolved around drawing together data from a range of sources, ensuring it was combined and applied in a consistent manner to estimate the impact of HS1 on demand, travel patterns (through responses such as mode switch) and travel costs (accounting for timetable changes, premium fares and changes in routing, with associated access and egress costs).

Figure 2.3 provides a simple graphical overview of the approach, focusing on the data sources used to provide the quantified elements of the evaluation/appraisal. Qualitative assessments of other impacts were made on the basis of the available data and additional evidence from sources such as literature review.

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[6] ATOC Passenger Demand Forecasting Handbook, version 5.0

Figure 2.3: Overview of Approach and Data Sources
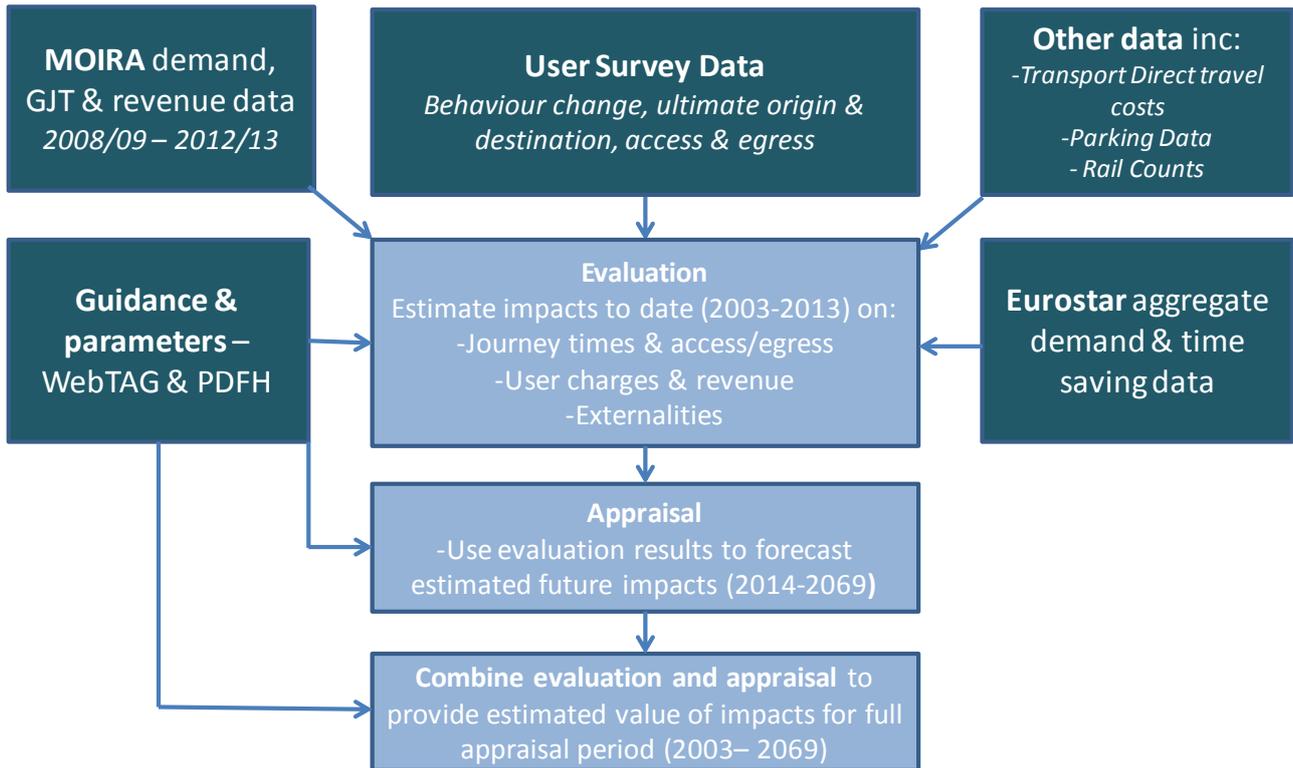
The flow chart shows that the key inputs to the process were:

- **Guidance and parameters** (from WebTAG and PDFH), providing inputs such as economic parameters and forecasts of future growth, used to forecast estimated future impacts and attribute monetary values to observed and forecast impacts;

- **Information on current transport conditions** used to forecast estimated future impacts and attribute monetary values to observed and forecast impacts, drawing particularly from:

  - available data on Eurostar demand (limited);

  - the rail industry's MOIRA timetabling program (providing domestic demand, revenue, timetable and generalised journey time information); and

  - primary survey research into passenger behaviour on High Speed domestic services - an on-board passenger survey undertaken specifically for this study, providing information particularly on the usage patterns and impacts of the scheme on travel behaviour.

Analysis using the MOIRA program and supporting evidence provided information on passenger numbers on HS1 and changes in station to station journey cost caused by HS1.

The MOIRA data lacked detail on aspects of travel behaviour, particularly on the nature of journeys to and from stations and changes in behaviour in response to HS1 (including mode switch, rerouting of rail trips and generation of new trips). Information on these additional dimensions was added through analysis of the survey responses, in conjunction with several sources of supporting information (such as access and egress times from Transport Direct[7]).

The survey was commissioned specifically for the study and was administered by handing out questionnaires on board approximately 70 trains during July 2013. The trains surveyed were identified to provide good coverage of the stations and times of day served by HS services. 91% of passengers who were approached to complete the questionnaire and agreed to take it, subsequently completed it, leading to 3,300 returned questionnaires. Appendix B, the Methodology Report on Train Surveys, provides more detail on the methodology, which benefited from extensive peer review by DfT research experts.

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[7]Journey Planning website: http://www.transportdirect.info/Web2/Home.aspx?&repeatingloop=Y

The questionnaires contained details of passengers' journey patterns and the reported likely travel behaviour for the surveyed journey in the absence of HS1. Following extensive data cleaning, matching and logic checking to maximise the utility of the data collected, the responses provided valuable additional information for the quantification of user benefits.

The responses were summarised by category for application to the MOIRA data, where categories were carefully defined in term of ticket types and groupings of station considered likely to experience a similar response to HS1 (on the basis of characteristics such as frequency of service, alternative available services and modes, urban or suburban nature of the station, its size and the availability and price of parking, whether directly served by HS or not and the alternative route to London).

The counterfactual scenario (i.e. the volume and pattern of rail demand in the absence of HS1) was derived by adjusting estimates (from MOIRA) of the number of passengers using HS1 by station pair to represent travel choices in the absence of HS1 on the basis of survey responses from the appropriate categories. These responses provided information on passengers' reported travel choices if domestic HS services[8] had not been implemented, providing estimates of the proportions to allocate to other rail services or modes in the counterfactual scenario and the number of trips that would not have been made (i.e. trips that were newly generated by HS1).

This approach to the derivation of the counterfactual was necessary because the evaluation process started after the implementation of the HS1 scheme and it was therefore not possible to survey and record baseline travel behaviour before HS1 to provide a counterfactual for comparison, in line with standard evaluation best practice. This means that there are no before and after measures in relation to travel behaviour for Southeastern services or those travelling in the South East more generally and it has been necessary to rely on the subjective views of survey respondents on what their behaviour would have been without HS1.

This approach is potentially less reliable that comparing consistent measures of actual behaviour captured before and after scheme implementation. However, it is a useful approach and has strengths in that the questions and responses focus specifically on the impacts of HS1 and how people feel they have responded to it. As user benefits are driven primarily by passenger's perceptions, recording passengers' views on how their behaviour has changed in response to the scheme (whilst it is still a recent event) is likely to provide a useful insight into the scale of user benefit. The analysis will also potentially be less complicated than a before and after study which would involve the need to separate out the effects on travel behaviour of other concurrent changes from the impacts of HS1.

Once the counterfactual had been derived, estimates of the value of domestic transport user, non-user and revenue impacts of HS1 were then calculated using the standard 'Rule of Half' approach[9] and drawing on:

- Estimated rail demand in the 'with HS1' and counterfactual scenarios;
- MOIRA information on the change in station to station generalised journey times (GJT) and fares caused by HS1 (with GJT changes identified on the basis of the difference in the timetable before and after the implementation of HS1 and domestic HS services)[10]; and

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[8] A suggested cross check of the Counterfactual identified in the Scoping Note to be undertaken by applying PDFH growth to a pre HS1 demand matrix was not carried out as the approach was trialled on the control corridors used in the Regeneration workstream and the results compared against observed demand. The comparison suggested that, particularly in unusual economic circumstances such as those that have prevailed over recent years, the PDFH approach does not appear sufficiently precise at the disaggregate local level to provide the type of detailed comparison required for this study. Its use would only have added a further level of uncertainty as to whether differences were the result of limitations of the forecasting process or another source.

[9] The Rule of Half approach is a standard method applied in transport appraisal to estimate the consumer surplus generated by changes in transport provision as $\frac{1}{2} (T_0 + T_1)*(C_0 - C_1)$ (where T_0 and T_1 are the Do Minimum and Do Something demand respectively and C_0 and C_1 are the Do Minimum and Do Something travel costs. The approach is based on the assumption that the short section of the demand curve between the Do Minimum and Do Something scenario can be approximated to a straight line and therefore the area under the curve between the Do Minimum and Do Something points (i.e. the difference in consumer surplus) can be approximated to a rectangle and triangle. This approach is explained in more detail in the Scoping Note attached as Appendix A to this report.

[10] MOIRA provided generalised journey times between each station pair for the weekday, Saturday and Sunday May 2009 timetable (before domestic HS services) and December 2009 and subsequent timetables (after domestic HS services). For journeys to and/or from stations served by HS1, GJT was taken from December 2009 and then from the timetable for May in each year, assuming that any subsequent revisions were also the result of HS1. For other Southeastern journeys only the changes between the May 2009 and December 2009 timetables were considered for all subsequent years (with a range of assumptions made on the proportion of the changes that could be attributed to HS1 as described below). Any changes in GJT for these journeys after December 2009 were assumed to be wholly unrelated to HS1. Two versions of each post HS1 timetable were used, one including the HS1 element of the timetable and one excluding it (e.g. terminating Margate HS services at Ashford and those from Faversham at Gravesend). This

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- Survey information on change in station choice and associated change in access and egress costs.

Broad estimates of the potential value of impacts on reliability, punctuality and crowding were also made on the basis of available information (train counts and performance data), recognising that it was not sufficiently detailed to enable a definitive distinction between the impacts of HS1 and the other complex impacts on travel demand over the same time period (including the economic downturn and changes to provision on other services). Indicative estimates of the value of the impact of rolling stock quality improvements were also made on the basis of available evidence and PDFH guidance.

Data availability for international services was considerably more limited and benefits were calculated on the basis of data on demand using Eurostar (from Eurotunnel press releases[11]), estimates of the proportion of trips travelling for different purposes (from the Office for National Statistics, International Passenger Survey[12]), estimates of the proportion generated or switching from other modes (informed by the evidence for longer domestic trips and demand trends) and information on the impact of HS1 on journey times.

Commercial confidentiality constraints mean that it has not been possible to present all data for either domestic or international services in full detail.

2.4.   Overview of Current Impacts and Usage

As outlined above, information on the current travel costs faced by HS and other Southeastern passengers, their travel patterns and the ways in which they have been influenced by HS1 and associated timetable changes formed a key input into the quantified element of the assessment. The following sections provide more information on the scale and nature of these inputs which underpin the evaluation element of the assessment (assessing the impacts observed to date, between 2003 and 2013) and provide the basis for forecasting future impacts for the remainder of the appraisal period (2014 to 2069).

2.4.1.   Journey Time Savings

2.4.1.1.   On train travel time

The most direct influence of HS1 is the significant reduction in travel time for journeys along the link. For Eurostar users, the introduction of Phase 1 of HS1 at the end of 2003 reduced journey times by 20 minutes. The second phase in 2007 (which moved the terminal to St Pancras from Waterloo) achieved an additional 13 minute reduction, leading to a total saving of 33 minutes relative to the pre-HS1 route[13].

Similarly, as illustrated in Figure 2.4, the domestic HS services achieve significant reductions in direct journey times, particularly to London from central and east Kent. For instance, the route from Ashford to London via HS1 is 47 minutes faster than the mainline equivalent. Similarly, the travel time from Ramsgate to London is 49 minutes lower than the mainline equivalent.

The benefits of rail schemes are considered for an evaluation/appraisal in terms of Generalised Journey Time (GJT)[14] which takes account of average waiting and interchange times on a journey as well as direct station to station journey times. Some of the direct HS services (particularly from the furthest extent of the network) are relatively infrequent (for instance, the network to the east and north of Ashford only has an hourly direct service for all but the peak period of the day, which is morning or evening dependent on direction). This low frequency increases typical wait times and decreases the likelihood of the available trains fitting closely with the passenger's optimal travel time. In some cases the introduction of HS1 has also led to changes in service frequency throughout the day. Once these factors have all been considered in the

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reflected the options available to and therefore GJT changes experienced by passengers not paying the premium HS fare in the with HS scenario.

[11] http://www.eurotunnelgroup.com/uk/media/press-releases/

[12] International Passenger Survey: http://www.ons.gov.uk/ons/about-ons/get-involved/taking-part-in-a-survey/information-for-households/a-to-z-of-household-and-individual-surveys/international-passenger-survey/index.html - additional detailed breakdowns of the survey results were provided by DfT for the purposes of this study.

[13] Savings figures used by the NAO in The completion and sale of High Speed 1, National Audit Office, March 2012 http://www.nao.org.uk/report/the-completion-and -sale-of-high-speed-1/. Note that international passengers to and from Ashford International did not experience any additional time savings as a result of HS1. However, the Office for National Statistics' International Traveller Survey suggests that they only account for 2% to 3% of journeys made.

[14] Generalised Journey Time is typically a measure of all journey time from journey origin to destination including elapsed time, weightings for different types of activity (e.g. waiting time is perceived to have higher cost than in-vehicle time). Some definitions may also include monetary costs such as fares converted into time values using values of times. However the MOIRA program has a specific definition of GJT which relates only to the time related elements of journeys between stations i.e. waiting, interchanging and travelling time, not time to reach or leave the station and not monetary costs.

calculation of average daily GJT in MOIRA,[15] savings are less marked, but still substantial. For instance, the GJT savings for journeys from Ashford and Ramsgate to London are 30 to 35 minutes.

Figure 2.4: Direct Journey Time Savings to London on HS Services
(shortest journey times mainline, HS & saving)(mins)
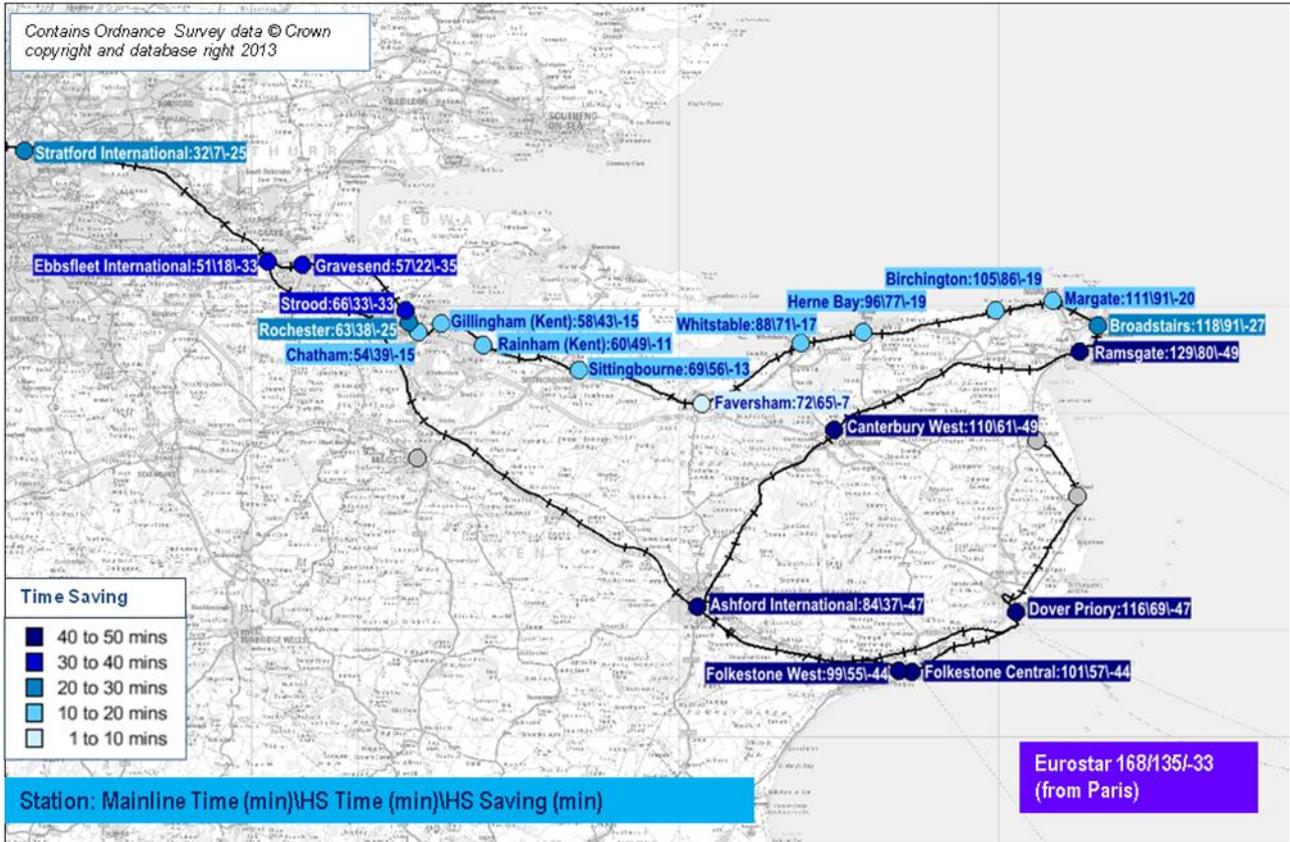
Sandwich, Deal and Maidstone West also have peak only direct services

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[15] MOIRA calculates GJT using the 'Rooftop' model to represent frequency and waiting impacts. This results in slightly different weighting being applied to different elements of journey time to the WebTAG guidance (of 2.5 for waiting time for non-business trips and 1 for business trips) but this minor discrepancy was considered worth the ability to use more detailed timetable based information in calculating GJT.

Table 2.2: Direct Journey Times to London, 2013

Origin	Mainline Time to London	Time to London via HS1	Saving	Origin	Mainline Time to London	Time to London via HS1	Saving
Stratford	32	7	25	Whitstable	88	71	17
Ebbsfleet	51	18	33	Herne Bay	96	77	19
Ashford	84	37	47	Birchington	105	86	19
Gravesend	57	22	35	Margate	111	91	20
Strood	66	33	33	Broadstairs	118	91	27
Rochester	63	38	25	Ramsgate	129	80	49
Chatham	53	39	15	Canterbury W	110	61	49
Gillingham	58	43	15	Folkestone W	99	55	44
Rainham	60	49	11	Folkestone C	101	57	44
Sittingbourne	69	56	13	Dover Priory	116	69	47
Faversham	72	65	7	*Eurostar*	*168*	*135*	*33*

Source: Southeastern website: https://www.southeasternrailway.co.uk/your-journey/network-map/

The domestic HS services were fully introduced to the Southeastern timetable in December 2009. At that time, the whole timetable was changed significantly from previous versions, with changes across many of the services, including changes in timing and frequency, along with additions and removals of stations in stopping patterns. Some of these changes were directly associated with the introduction of HS1 (such as changing timings and stopping patterns to tie into HS1 services and the use of cascaded rolling stock freed up by the new HS trains), whilst others were unrelated. However the changes were complex and multifaceted, and the DfT and Southeastern advise that it is not possible to categorically distinguish those changes directly associated with HS1. The analysis presented below addresses this issue by providing a range of estimates of the impacts of HS1, based on different assumptions on the proportion of the wider timetable effects that can be considered directly attributable to HS1.

The DfT's HS1 concession team identifies three types of impact from HS1 and associated time table changes:

- **Direct** i.e. the benefits experienced on journeys fully on the HS1 link i.e. for passengers travelling between any combination of Ashford, Ebbsfleet, Stratford International and St Pancras stations;
- **Secondary** i.e. benefits experienced by those who use Classic Rail to access HS1 (with associated time savings and additional journey opportunities) either:
  - **Without interchange** i.e. on HS services from Gravesend, Strood, Rochester, Chatham, Gillingham, Rainham, Sittingbourne, Faversham, Whitstable, Herne Bay, Birchington, Margate, Broadstairs, Ramsgate, Canterbury West, Maidstone West, Sandwich, Deal, Dover Priory, Folkestone Central and Folkestone West. There is considerable variation in the scale of benefit experienced on journeys from different stations, with journeys from stations in East Kent experiencing significantly greater benefits than those from North Kent, as shown in Figure 2.4 and Table 2.2. Maidstone West, Sandwich and Deal did not have direct services in the original timetable specification, (connecting via Strood and Ramsgate/Dover Priory respectively) but have benefited from the introduction of direct peak services in subsequent timetable revisions; or
  - **With interchange** e.g. stations on lines into Ashford, such as Rye.
- **Indirect** i.e. impacts on journeys that do not use the HS1 line at all, due to other effects such as rolling stock cascade (which for instance allowed 2 extra off peak services per hour from Tonbridge to Charing Cross), or changes in service frequency, stopping patterns or timing to feed into HS trains (but, to avoid double counting, considering only the impacts on those passengers who do not use the services to access HS1 - as those who do use HS1 would be covered under the secondary impacts described above).

2.4.1.2. Impacts on Access/Egress

For some domestic passengers the journey time impacts are either supplemented or offset by savings or increases in the costs of accessing/egressing rail stations for their journey. This is partly the result of the HS trains terminating at St Pancras rather than the terminals of Waterloo, London Bridge, London Victoria and Charing Cross which are served by the non HS mainline Southeastern trains from that area, meaning that many passengers now have a choice of a south or north London terminal. For those choosing St Pancras, the change alters travel costs in London for both those passengers with ultimate destinations there and those travelling across London for onward travel beyond.

Some passengers also choose to change their choice of station outside of London to make use of HS services, further influencing access and egress costs. The passenger survey suggested that, of the 77% of respondents who would use rail in the absence of HS1, approximately 12% would use a different route (primarily using a different station outside of London or, in a small proportion of cases, using a central London terminus rather than Stratford International). For instance, Ashford is the point at which a large proportion of journeys join HS services, drawing passengers from a wide catchment area as illustrated in Figure 2.5 below. Of those using Ashford who would travel by rail whether or not HS1 existed, approximately 15% report they would use a different station in the absence of HS1, altering the costs of station access/egress for the rail journey.

Figure 2.5: Destinations of Passengers Leaving HS Rail at Ashford
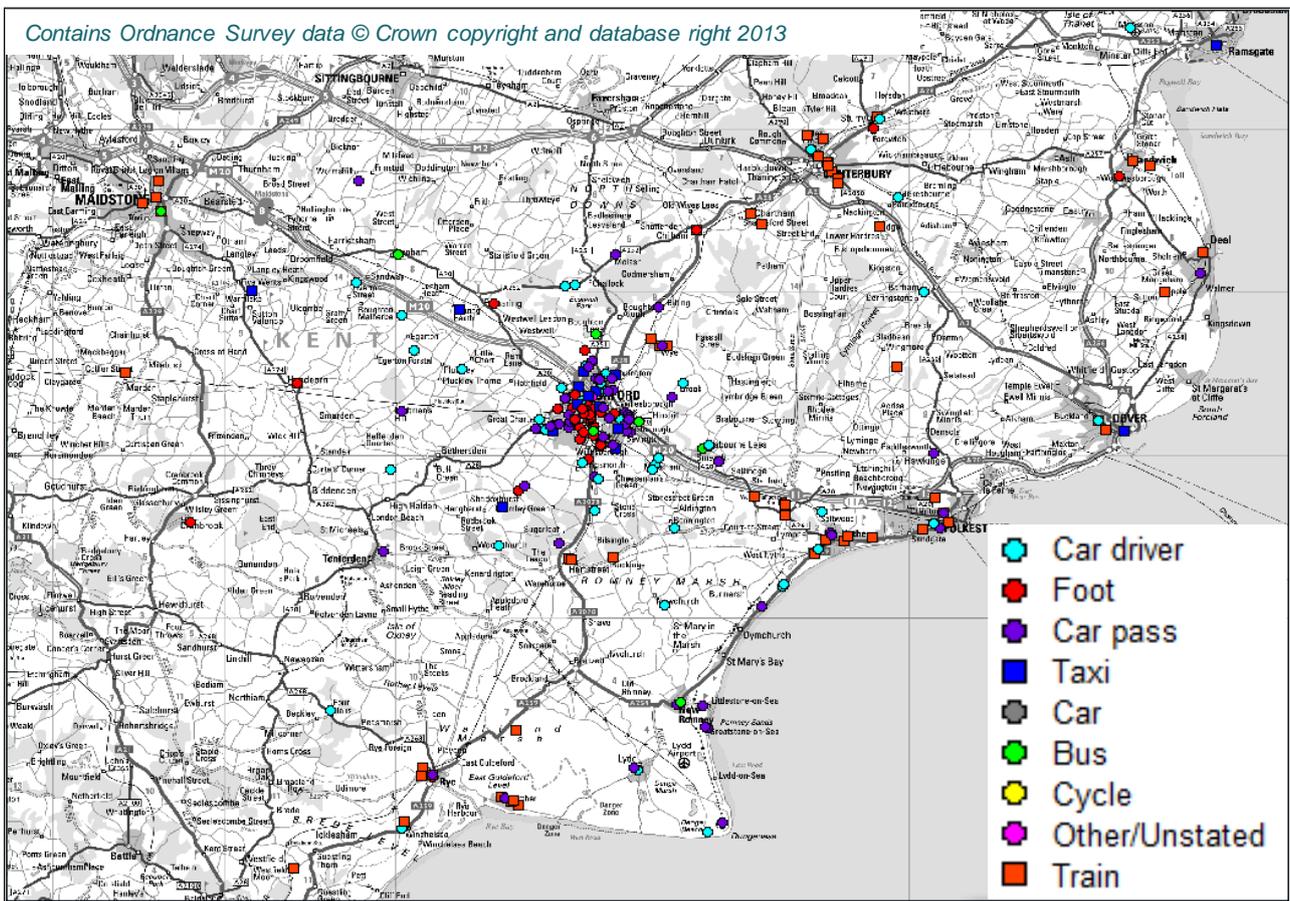
Source: User Survey

2.4.2. Premium Fares

Passengers are required to pay premium fares to access the benefits associated with travel on HS services using HS1. As the illustrative season ticket prices in Table 2.3 show, premium fares are typically approximately 20% greater than the fares for journeys via routes other than HS1. Daily tickets show a similar proportional uplift (for instance an increase of £4 to £6 on an anytime single).

Table 2.3: 2013 Illustrative Season Ticket Prices

Journey	Annual price without HS1 (£)	Annual price with HS1 (£)	Premium uplift
Ashford – London	4,780	5,736	20%
Canterbury – London	4,812	5,768	20%
Margate – London	4,864	5,820	20%
Gillingham – London	3,672	4,596	25%

Source: Southeastern website, December 2013,
https://tickets.southeasternrailway.co.uk/se/en/journeyplanning/seasonmixingdeck

From the passengers' perspective, these increased fares partly offset the journey time savings provided by HS1.[16] The balance between the impacts depends on the length of the journey and the value the passenger attributes to saved travel time (which is in turn influenced by journey purpose) and influences the overall monetary value of the user impacts, as discussed further below.

Other fares on the Southeastern network were not affected by the introduction of HS1[17].

2.4.3. Crowding, Reliability, Punctuality and Quality Benefits

The introduction of HS1 has also generated other impacts for passengers in the form of changes in crowding, reliability, punctuality and rolling stock quality.

2.4.3.1. Crowding

The additional HS services have added capacity to the network. For instance, the introduction of HS services in peak hours[18] represents a 40% addition to the longer distance (i.e. Mainline) peak morning capacity into London from North and East Kent.[19] The proportions are similar in the evening peak as shown in Figure 2.6 below which illustrates peak capacity on the selected Mainline trains and HS1 in 2008 and 2010 (before and after the implementation of HS1).

It is not possible to definitively distinguish the crowding relief caused by the additional HS services. Several other influences have an influence on travel demand and crowding levels over the same time span, including changes in demand associated with the economic down turn and changes in frequency and capacity on some of the existing services. However, the net effect of HS1 appears to have been a reduction in average crowding. This is the consequence of lower than average crowding levels on the HS services themselves and some relief on the services from which people have transferred to use HS services.

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[16] Although, at the wider society level the increased fares costs to passengers are balanced by the benefit of increased revenue received by Southeastern.
[17] The above average RPI + 3% increase in Southeastern fares before the introduction of HS1 which has been attributed to HS1 in some sources, was associated with earlier investment and unrelated to HS1.
[18] Nineteen HS services arrive in central London between 07.00 am and 10.00 am on an average week day.
[19] Defined as all Southeastern Mainline services, except the line from Hastings via Tonbridge which is beyond the main sphere of influence of HS1. Southeastern Metro services were not included as they are local stopping services and largely serve a different market. Source DfT PIXC data.

Figure 2.6: Capacity on Southeastern Peak Trains to and from Central London, 2008 and 2010
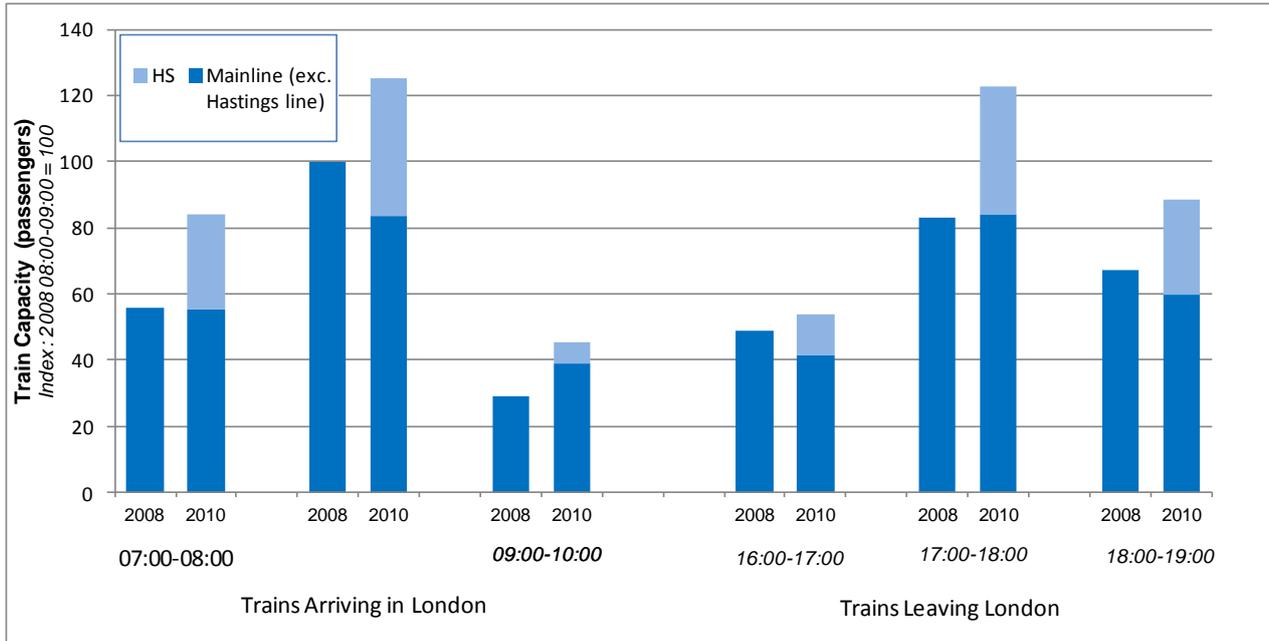
Source: Southeastern capacity data

2.4.3.2. Punctuality and Reliability

The introduction of HS services has also influenced the service reliability and punctuality experienced by passengers. Again the impacts are difficult to distinguish from other complex influences affecting train performance over the same timeframe.

However, more detailed data underlying the Network Rail's published reliability and punctuality data[20], the Public Performance Measure (PPM) appears to show a positive overall effect, with above average performance for HS trains.

2.4.3.3. Journey Quality

The domestic HS services are operated with a fleet of new, service specific trains with 'HS' branding. They offer a high quality passenger environment with good levels of passenger space, comfort and information. As such they offer an improvement over the more typical regional commuting trains operating the Mainline routes in Kent. The National Rail Passenger Survey [21]provides evidence that the difference is valued by passengers, with higher ratings (in terms of the proportions of respondents answering that they are satisfied rather than neutral or dissatisfied) for HS services. This implies that passengers who would otherwise use other trains experience a journey quality benefit as a result of using HS services.

The survey covers 30 questions, the average results for the last four years for some of the questions most relevant for considering the quality of rolling stock are provided in Table 2.4 below (as this is the element of journey quality for which the PDFH provides a monetary valuation). The last two questions shown have been included in addition as they provide some corroboration for the crowding, reliability and punctuality benefits discussed above.

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[20] The national Public Performance Measure (PPM) combines figures for punctuality and reliability into one performance record. It measures arrival punctuality of individual trains at their final destination against their planned timetable (the 'plan of the day' which may include pre-published engineering amendments). For local services such as those operated by Southeastern the PPM proportion reflects the percentage of trains that have arrived within 5 minutes of timetabled time, having called at all stops. Any that are cancelled or do not meet these criteria are counted as failures. More detailed PPM data separating HS services from other Mainline services underlies the published Southeastern data and has been used as the basis of the analysis presented here, but confidentiality issues prevent it from being presented in more detail.

[21] A network wide survey of 50,000 passengers p.a. arranged by Passenger Focus on representative journeys to provide information on passenger satisfaction http://data.passengerfocus.org.uk/train/nps/question/service-overall/. The survey is designed to provide a representative view of satisfaction across the range of passenger characteristics. Data is published only for categories with a sample size over 50 and in the most recent Wave the overall Southeastern results were based on a sample of 1632 respondents. The data presented above was drawn from the ORR's open data tool, developed specifically to allow performance to be compared across different TOCs and/or services on a consistent basis.

Table 2.4: National Rail Passenger Survey, Selected Questions: % of Respondents Satisfied
(average values 2010 to 2013)

Survey Question	Mainline	HS	Difference
Overall, how satisfied were passengers with the journey?	81%	93%	12%
How good was the information provided	73%	90%	17%
How good was the comfort of the seating area on the trains?	69%	92%	23%
How good did passengers feel their personal security was on the trains?	77%	89%	12%
How good was the cleanliness of the inside of the trains?	72%	97%	24%
How good was the upkeep and repair of the trains?	73%	97%	24%
Crowding/Reliability/Punctuality			
How good was the amount of room to sit/stand on the trains?	69%	90%	21%
How satisfied were passengers with train punctuality and reliability?	77%	91%	14%

Source: National Rail Passenger Survey, 2010 to 2013

2.4.4.   Domestic Demand

2.4.4.1.   Characteristics of Demand

The responses to the user survey showed that HS services are used for a wide range of journeys, as illustrated in Figure 2.7. It is important to note that the density of dots representing survey responses in London and Kent on the map is very high and, despite their visual dominance, overall the points beyond London only account for 12% of the survey responses. MOIRA ticket data suggests that the total number of journeys through London from Kent accounts for only 8% of total HS demand. The use of HS1 is therefore strongly dominated by journeys into and out of London (79% of total trips) with the remaining 14% of journeys occurring within Kent or to neighbouring East Sussex.

Figure 2.7: Passenger Survey Responses: Journey Origins and Destinations


Origins

Destinations
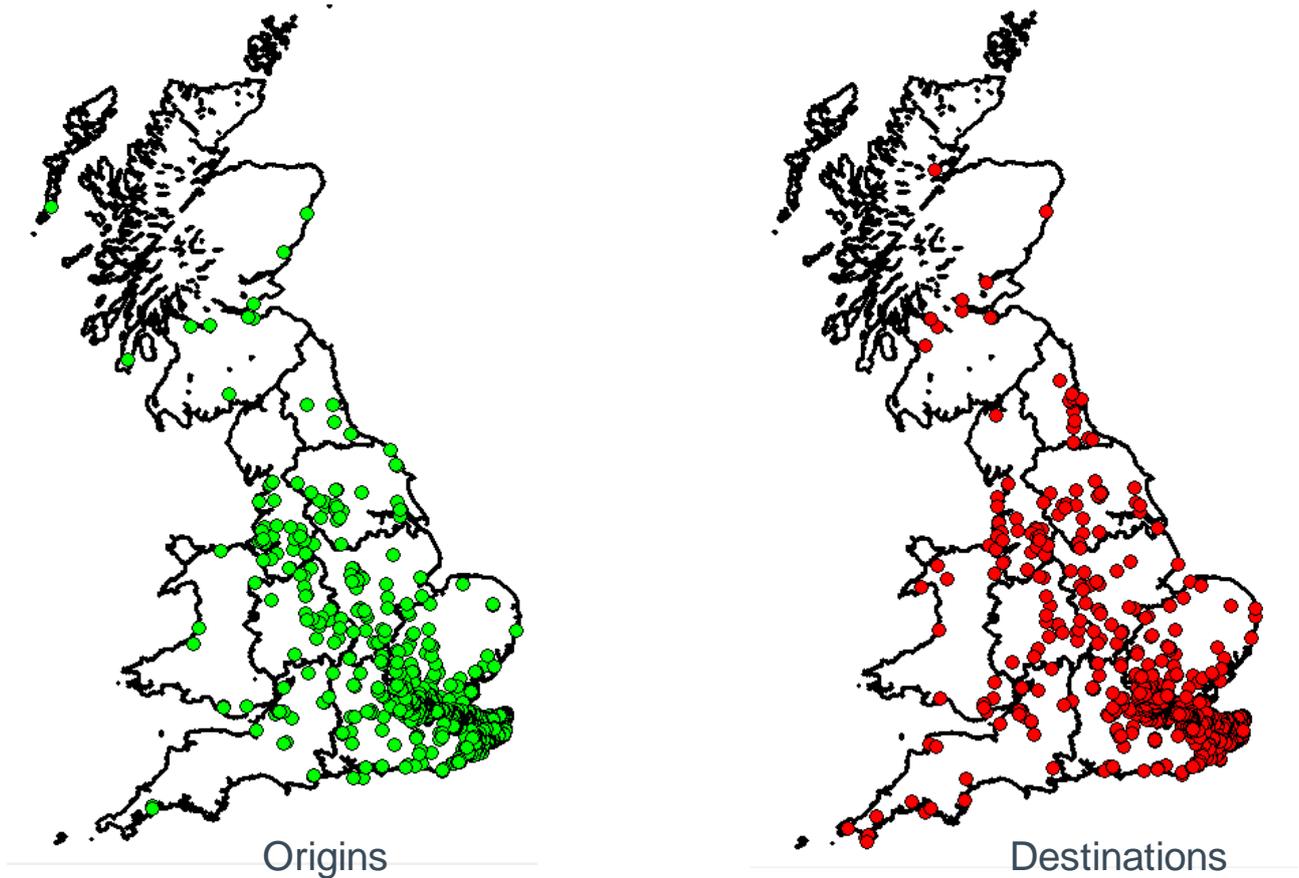
Figure 2.8 illustrates the pattern of journey origins more clearly, showing that they are widely spread across Kent but with the highest concentrations around Ashford, Canterbury and the Medway Towns. It highlights the role of Ashford as a railhead in response to the significant journey time savings to/from that station compared to journeys via other stations in the wider area.

Figure 2.8: Passenger Survey Responses: Journey Origins in Kent, Sussex and London
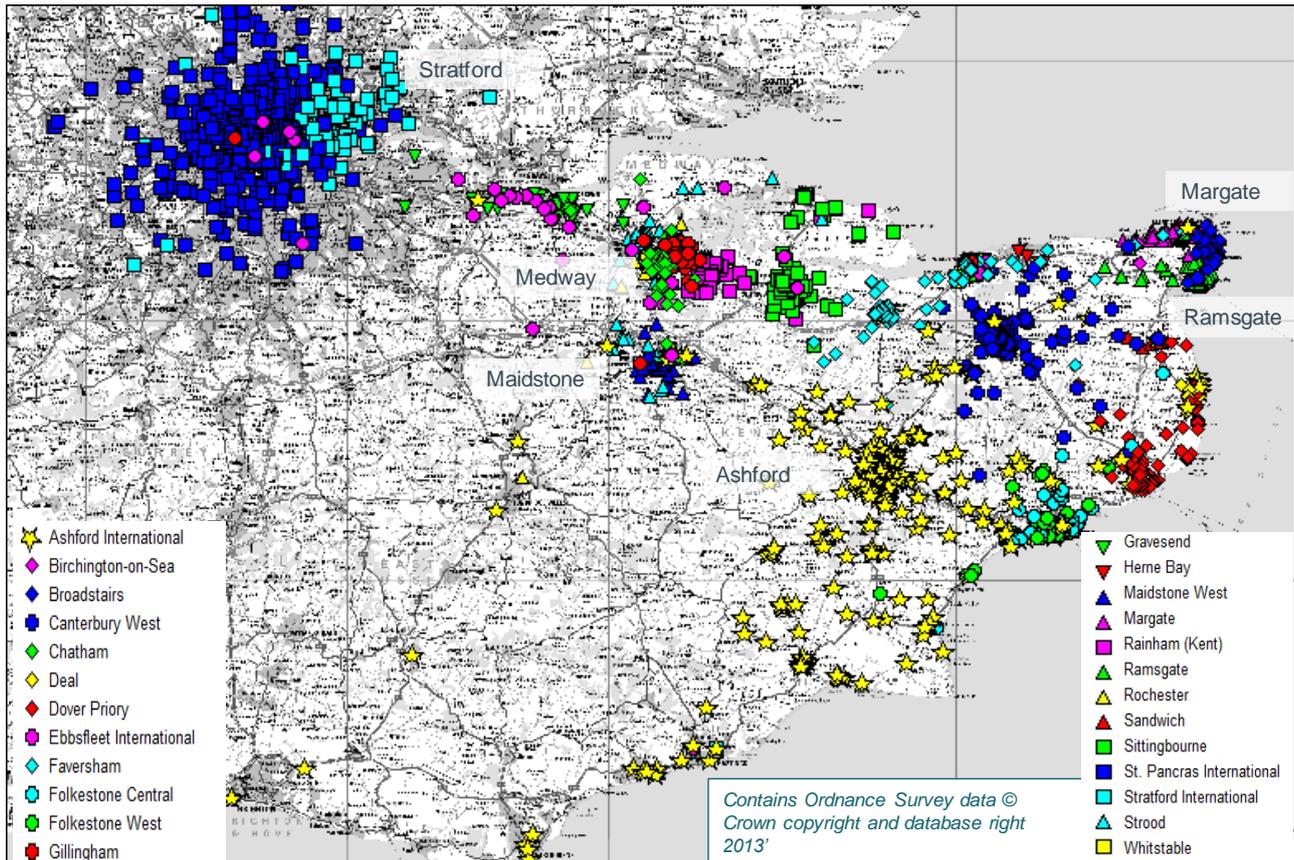

Source: Passenger survey. Note the location of markers identifies ultimate origin of journey (e.g. home), the colour and shape identifies the station at which the respondent first boarded the HS train.

Figure 2.9 shows the number of survey respondents boarding at each station, alongside the total number of HS tickets for journeys starting/ending at each station (excluding St Pancras), drawn from the MOIRA ticketing data for 2012/13. The comparison shows that the survey responses follow the pattern of ticket sales relatively well, apart from some under representation at Ebbsfleet (likely to be caused by busy trains and short journey times) and over representation at some of the coastal stations such as Dover Priory and Broadstairs. The assessment of user benefits was linked directly to the observed demand from the ticket sales so any inconsistency between the survey responses and ticketing data will not have influenced the overall quantified results. Both sources of data clearly show that demand is particularly concentrated around relatively few stations.

Figure 2.9: Passenger Survey Response and Ticket Sales by Origin Station
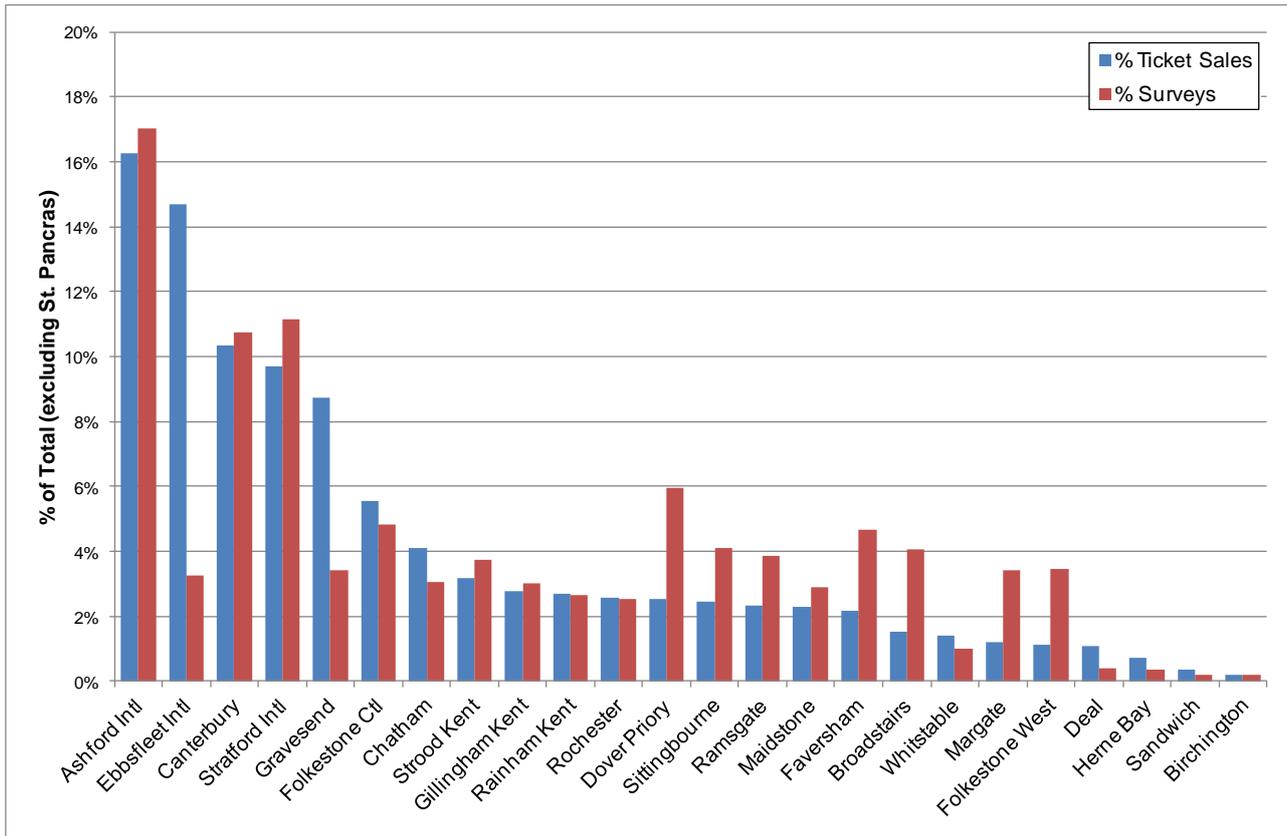
Source: Survey Data & MOIRA 2012/13

The MOIRA ticket data suggests some variation in the type of HS1 ticket sold at different stations, with more season tickets from certain category of stations, including those (such as Westenhanger and Headcorn) commuting via Ashford to London. On average, of the HS1 premium fare tickets sold in 2012/13, nearly 50% were season tickets, this is less than the average for Southeastern as a whole, as shown in Table 2.5, with the difference made up by above average reduced fare ticket sales. This is likely to reflect the predominance of commuting (and associated season tickets) from the Metro stations closer to London on the wider Southeastern network.

Table 2.5: Ticket Sales by Ticket Type, 2012/13

Origin	HS1	Southeastern
Full Fare	16%	17%
Reduced Fare	38%	28%
Season	46%	55%

Source: MOIRA Data 2012/2013. Full fare refers to the equivalent of Anytime fares with Reduced fare covering all others except Season tickets.

2.4.4.2. Demand growth and source

The demand for HS services has grown steadily since implementation at above the average rate for Southeastern or national services as shown below in Figure 2.10 and Figure 2.11 below. The figures show an overall decline in Southeastern usage between 2008/09 and 2009/10, this reflects the impact of the economic downturn and is consistent with wider trends in patronage across the South East at this time. For instance, the Network Rail London and South East Market Study shows that, against a context of an average 4% annual growth in passenger kilometres in the London and South East market since the early 1990s, passenger kilometres decreased significantly between Q4 2008/09 and Q3 2009/10, with the fastest rate of decline in Q1 and Q2 2009/10 being equivalent to an annual rate of decline of 5%[22].

Figure 2.10: Growth in Demand for HS Services 2007/08 to 2012/13
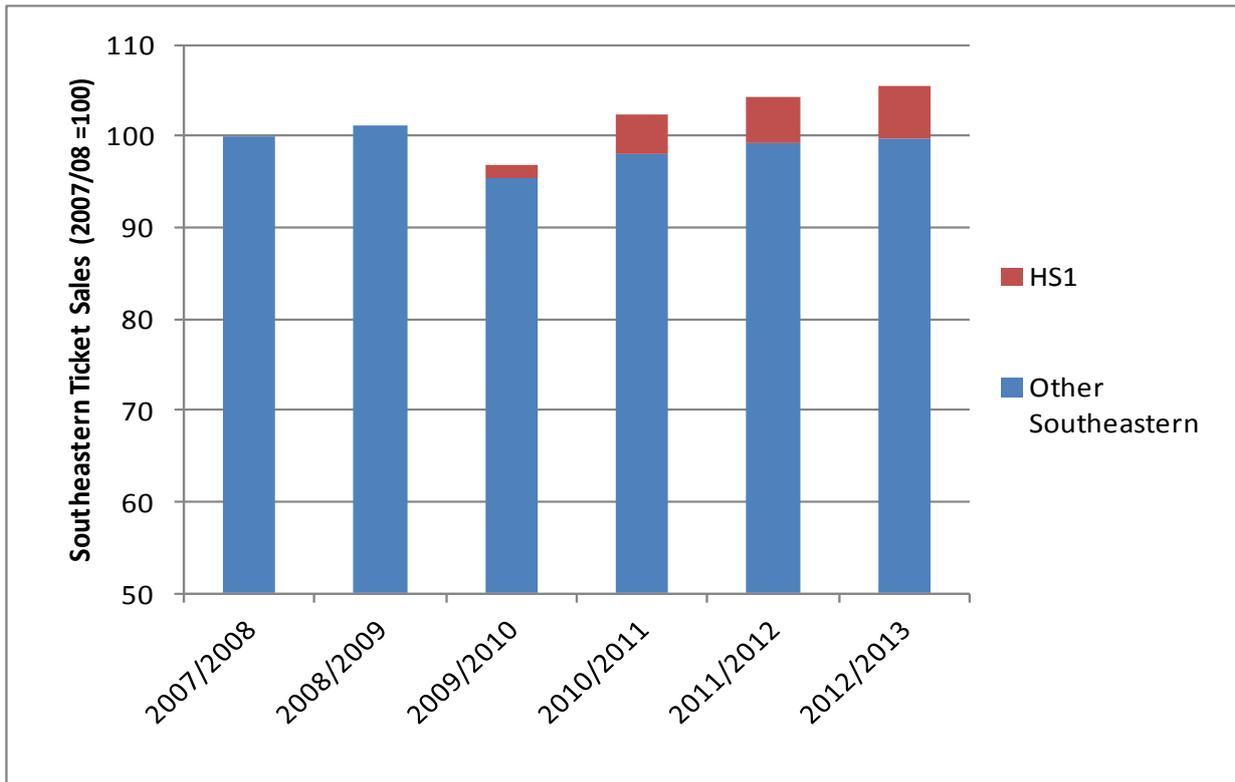
Source: MOIRA data. For reference, the total number of rail journeys on the Southeastern network in 2013 is quoted to have been approximately 173 million - http://www.go-ahead.com/ourcompanies/rail.aspx

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[22] Figure 2.2 of the London and South East Market Study,

Figure 2.11: Growth in Demand for HS Services using HS1 by Journey Type
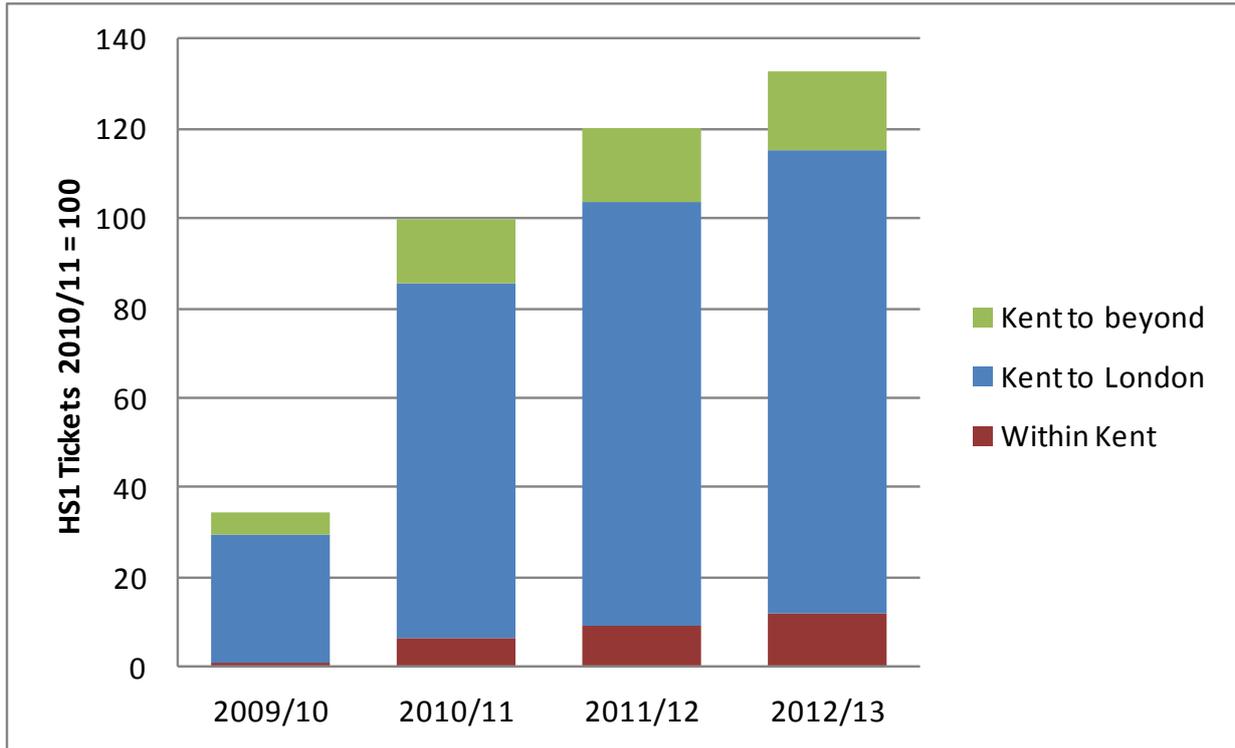
Source: MOIRA data

The user survey results suggest that the additional trips driving the growth in HS1 demand have been drawn from a number of sources. 77% of surveyed passengers reported that they would use other train services in the absence of HS1, 13% would use other modes (primarily car) and 10% would not travel and therefore represent wholly new trips generated by the opportunities provided by HS1 (as shown in Figure 2.12). The proportions vary by trip type and geography as shown in the illustrative examples in Table 2.6.

These variations were accounted for in the calculation of user benefits through identifying and applying different counterfactual assumptions for trips to and from different categories of station, as described above.

Figure 2.12: Passenger Survey Responses: Travel Behaviour in Absence of HS1
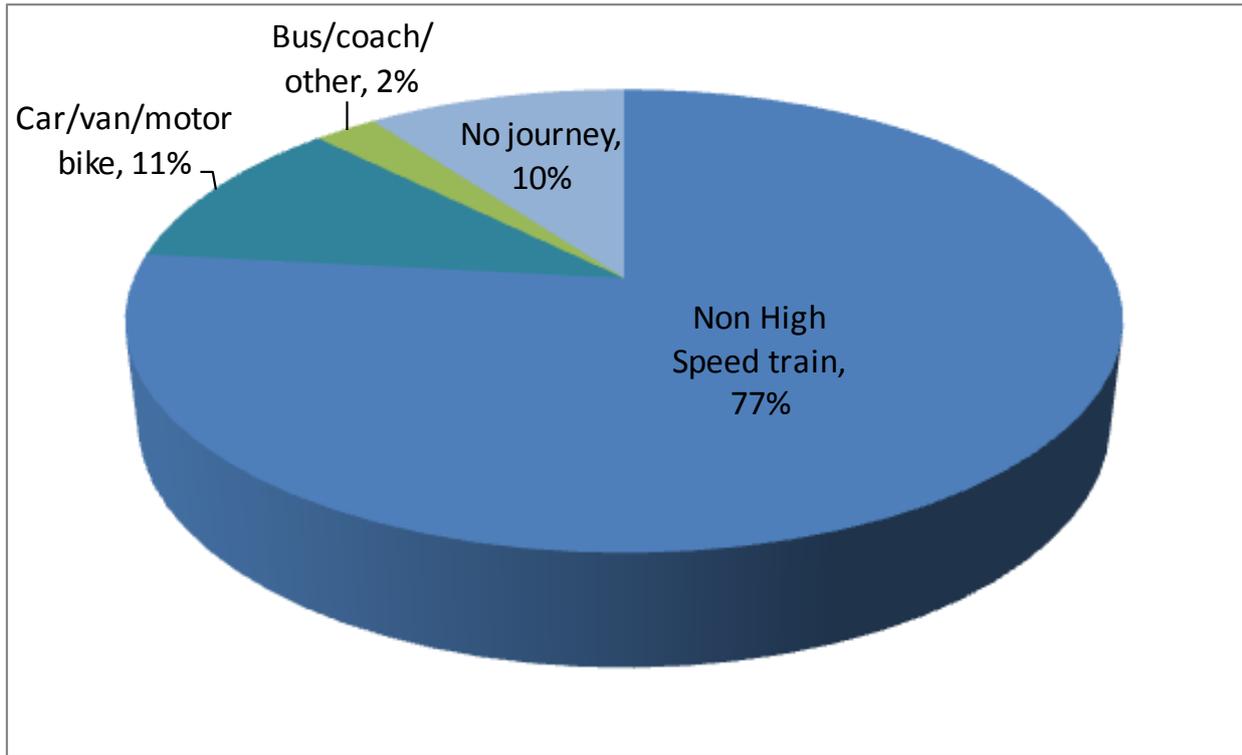
Source: Survey data

Table 2.6: Examples of Reported Travel Behaviour in the Absence of HS1

Behaviour in Absence of HS1	Overall	Ashford to St Pancras	Dover to St Pancras	Ramsgate to St Pancras	Gillingham to St Pancras	Faversham to St Pancras	Ashford to Stratford International
Other Train	77%	75%	71%	65%	90%	84%	57%
Car	11%	13%	8%	12%	8%	7%	24%
Bus/coach/other	2%	3%	3%	2%	1%	0%	2%
No Trip	10%	8%	18%	20%	1%	9%	17%

Source: Survey data

The figures suggest that longer journeys (e.g. from Margate) are more likely to be newly generated, potentially reflecting the fact that the time savings make commuting or leisure trips to London more feasible.

The proportion of trips transferring from car, and the type of trips on which it occurs, determines the level of road user benefits experienced as a result of decongestion benefits caused by traffic level reductions, as described below.

2.4.4.3. International Demand

The International Passenger Survey[23] suggests that boardings and alighting at the London terminal of Eurostar (firstly Waterloo then St Pancras) have consistently accounted for over 90% to 95% of the total UK activity, with the remainder now splitting broadly evenly between Ebbsfleet and Ashford.

The results also suggest that, on average, just over 70% of journeys are to or from France, with the large majority of the remainder travelling to or from Belgium. Between 20% and 25% of trips (varying by year) are made for business purposes.

Eurotunnel's quarterly press releases on passenger volumes[24] (as shown in Figure 2.13) show that the demand for Eurostar services has also steadily increased through time, showing notable upward steps after the implementation of HS1 improvements.

Figure 2.13: Eurostar Demand Growth
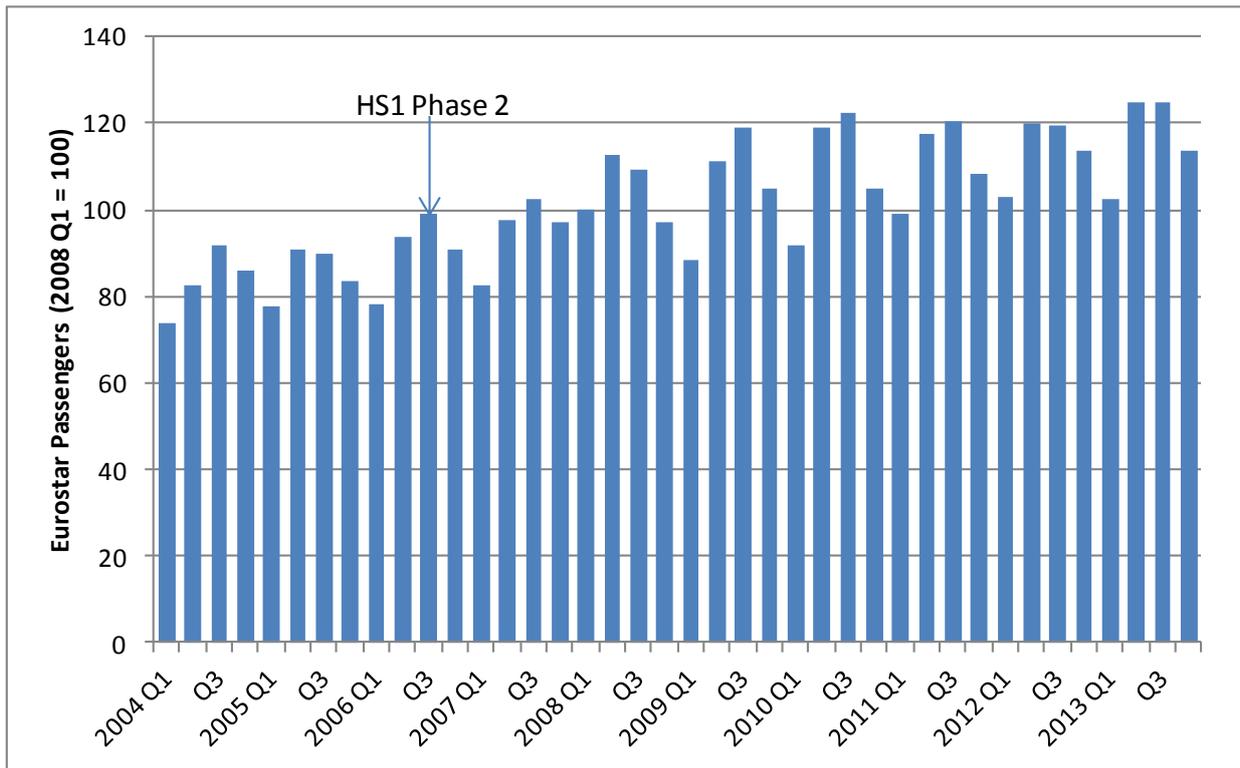
Source: Eurotunnel website

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[23] International Passenger Survey: http://www.ons.gov.uk/ons/about-ons/get-involved/taking-part-in-a-survey/information-for-households/a-to-z-of-household-and-individual-surveys/international-passenger-survey/index.html - additional detailed breakdowns of the survey results were provided by DfT for the purposes of this study.
[24] http://www.eurotunnelgroup.com/uk/media/press-releases/

2.5. Forecast Impacts and Use

However, as described in Section 2.3, when considering the cost effectiveness of a transport scheme, government appraisal guidance advises that it is necessary to assess impacts over 60 years from the opening of the full scheme. Therefore, to provide an assessment of the cost effectiveness of HS1, it is also necessary to forecast likely impacts over the remaining 56 years of the appraisal period (from 2014 to 2069)

The forecasts were made on the basis of the observed impacts and are described in more detail below.

2.5.1. Journey Time and Cost Impacts

The average generalised journey time saving per trip between a given pair of stations (including changes in access/egress time) has been assumed to remain consistent from 2012/2013 throughout the remainder of the appraisal period (with allowance made for growth in the real monetary value of time, in line with WebTAG).

Although a number of changes to the network and services are likely over the appraisal period, there is a lack of clarity on their form and timing as well as the extent to which the impacts could be considered attributable to HS1 itself. In this context, the most transparent and straightforward assumption was considered to be the continuation of current levels of benefits.

Both standard and premium domestic fares are assumed to grow at 1% above RPI each year until 2033, in line with DfT and industry assumptions. The scale of the premium fare differential is consequently forecast to grow at the same rate. International fares are assumed to grow in line with inflation.

2.5.2. Crowding, Reliability, Punctuality and Journey Quality Impacts

Average levels of crowding, reliability and punctuality benefits per trip have also been assumed to remain consistent through the remainder of the appraisal period.

This is likely to be a conservative assumption, particularly in relation to crowding, as the relative value of the additional capacity provided would be likely to increase in future years, as pressures on the network increase. However, there is no clear information on likely changes in future demand and capacity and the extent to which they could be attributed to HS1.

For journey quality benefits, a constant average incremental benefit has been assumed to apply throughout the appraisal period to smooth out variations in benefits throughout the cycles of rolling stock aging (reducing benefits) and renewal.

2.5.3. Demand

Domestic forecasts of demand growth were derived using the industry standard Passenger Demand Forecast Handbook methods (relating rail demand growth to change in key drivers such as population, employment and GDP, via elasticities[25], as described further in the Scoping Note). Forecast changes in drivers of demand were provided by the DfT, consistent with those used in their EDGE demand forecasting tool.

International growth was based on the most recent forecast presented in the National Audit Office report on HS1 (which has matched very closely with reported figures up until 2013)[26].

Figure 2.14 provides an illustration of the forecast scale of growth in demand using HS1 by ticket and service. In line with DfT guidance, growth in the central case is capped in 2033 (twenty years after the year of appraisal) with sensitivity tests to assess the impacts of 2023 and 2043 cap years.

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[25] Growth was estimated on the basis of elasticity based responses to forecast change in key drivers, as used in the DfT's EDGE forecasting tool (e.g. GDP per capita, population employment, rail fares, car ownership, fuel price, car journey times and travel costs by alternative modes including air, bus and underground.

[26] The completion and sale of High Speed 1, National Audit Office, March 2012 http://www.nao.org.uk/report/the-completion-and -sale-of-high-speed-1/

Figure 2.14: Forecast Demand Growth
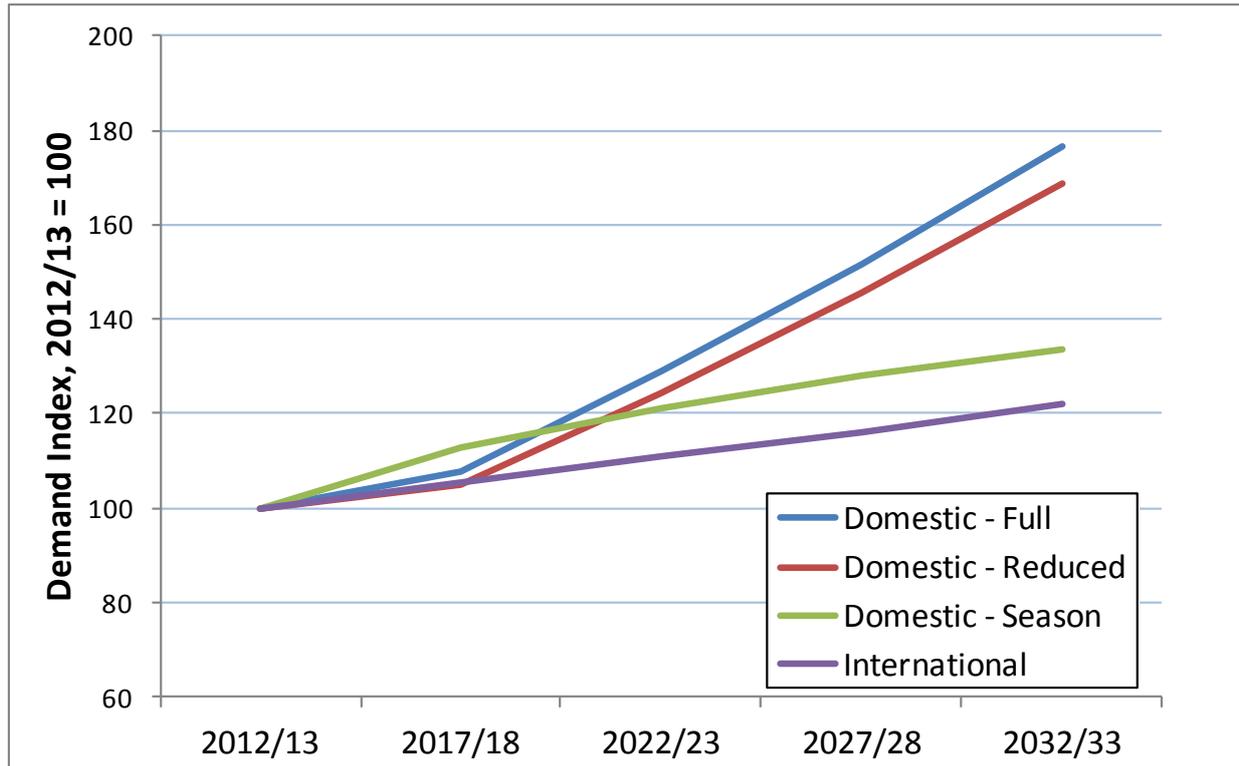
Source: EDGE assumptions and PDFH elasticities for domestic demand and NAO March 2012 report for international demand

For national and international demand, it has been assumed, in the absence of other information, that 'with HS1' and counterfactual (without HS1) travel between given pairs of stations would grow at the same rate through time (influenced by same drivers of population growth, employment, GDP growth etc.). This means that the proportional impact of HS1 on travel through time is forecast to remain consistent (for instance, a consistent proportion of HS1 demand by ticket type is assumed to have switched from other modes in all future years), whilst growing in absolute scale (as the total number of passengers grows).

It is worth noting that demand realised for HS1 will have been influenced by the scale of new development in proximity to HS1 stations. The original plans for Ebbsfleet included housing development of 10,000 housing units. However, to date only around 300 have been completed. Assuming one household per housing unit, and 2.3 persons per household (taken from the 2011 Census), and a trip rate of 20 surface rail trips per person per year (taken from the National Travel Survey for the Urban-Rural geographical classification), we estimate that annual demand for HS1 services could have been around 446,000 trips higher if Ebbsfleet had been developed as planned (around 5% of current journeys). More recently, government has announced plans for development of around 16,000 homes at Ebbsfleet.

2.6. Estimate of Rail and Road User Benefits

The estimated past (2003 to 2013) and future impacts (2014 to 2069) of HS1 and associated timetable changes on demand and journey costs described in the previous sections formed the basis of the estimated monetary value of impacts over the appraisal period to 2069, as summarised in Table 2.7. In broad terms approximately 15% of the benefits are derived from the impacts estimated to be caused by HS1 and associated timetable changes in the years 2003 to 2013 (i.e. the evaluation element of the assessment) and approximately 85% from the future impacts forecast to occur for the remaining 56 years of the appraisal period to 2069 (the appraisal element of the assessment). The balance is different for domestic and international benefits because international benefits have been accrued for 10 years whereas domestic benefits have only been accrued over 4 years to date.

The valuation process used WebTAG parameters for values of time (from the January 2014 release[27]) for all passengers, including those using Eurostar. The proportions of passengers travelling for different purposes

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[27] WebTAG Databook, January 2014: https://www.gov.uk/transport-analysis-guidance-webtag#webtag-data-book

(business, commuting and other) were derived from PDFH conversions from ticket type to journey purposes. Figures presented are net present values for the full appraisal period (in 2010 prices, discounted to a 2010 base year).

The range represents different possible assumptions on the proportion of indirect impacts directly attributable to HS1 (from 0% to 100%, as discussed in Section 2.4.1.1 above). Totals with and without the crowding, reliability and punctuality and rolling stock quality benefits are presented separately, reflecting the relatively greater levels of uncertainty in the calculation of these impacts.

Table 2.7: User Benefits
(PV, £m, 2010 prices and 2010 base year, appraisal period 2003-2069)

Impact	Total	Business	Commute	Other
Estimated User Impact Full Appraisal Period (NPV)				
International Journey Time Impact[28]	2,985	1,790	N/A	1,195
Domestic Generalised Journey Time Impact	1,410-1,925	700-950	510-715	200-255
Direct	645-625	330-320	225-220	90-85
Secondary	765-895	370-440	280-330	110-125
Indirect	0-405	0-190	0-165	0-50
User charge impact	-580	-100	-335	-140
Decongestion benefits & road accident savings	825-885	N/A	N/A	N/A
Externalities	40-45	N/A	N/A	N/A
Total	*4,680-5,265*	*2,390-2,640**	*170-380**	*1,255-1,310**
Crowding	315	130	165	20
Reliability and punctuality	85	35	40	5
Rolling stock quality	75	40	25	10
Total (inc. crowding, reliability & quality)	*5,155-5,735*	*2,595-2,840**	*405-610**	*1,295-1,350**

* Sub-totals and totals by purpose do not include decongestion benefits and externalities as these impacts are not calculated by purpose

The journey time savings experienced by international and domestic passengers account for the greatest proportion of benefits, totalling an estimated £3.0bn and £1.4bn to £1.9bn respectively over the appraisal period (PV 2010 prices and values), accounting for 50% and nearly 30% of the total positive impacts benefits respectively (based on the midpoint of the domestic user benefit range).

The large majority of the benefit is associated with changes in station to station travel time, with changes in the cost of accessing and egressing stations only accounting for approximately 2% of the domestic total (the net effect of benefits for some journeys and increased costs for others).

Direct benefits (journeys wholly on HS1) and secondary benefits (journeys accessing HS1 via classic rail) both account for significant proportions of user time benefits on domestic train services, 38% and 50% respectively (if half of the indirect benefits are considered attributable to HS1). The indirect benefits account for between 0% and 20% of the total, depending on the proportion considered directly attributable to HS1.

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[28] Estimated international journey time savings are about 40% lower than the estimate in the NAO 2012 report. This is the result of a number of factors, including a revision to estimated values of time in WebTAG 2013 which reduced business values of time by approximately one third (whilst increasing values for other purposes by only approximately 6%). The NAO figure also assumed no new trips whilst the new assessment assumes 10% to 15%, halving the value of benefits for those trips according to the rule of half approach. Thirdly the NAO assessment assumed 30% of those using Eurostar were travelling for business purposes, based on a figure from the 2006 International Passenger survey, as used in the Volterra 2009 HS1 report and reflecting the proportion of business travel amongst international residents entering the UK through the tunnel. The new assessment draws on more detailed data from the International Passenger Survey, as provided by the DfT. This has led to the use of a business proportion of 22% based on Eurostar passengers only and covering UK residents leaving the country as well as international residents arriving. Finally, there may also be differences in forecast demand growth as it was not possible to obtain the detail of the assumptions made by the NAO. If the previous values of time, and assumptions of 30% business travel and 0% generated trips are used in the updated assessment, it produces estimated total International time savings of £4.9bn, very close to the NAO's £5.1bn estimate.

These benefits are largely associated with journeys on the line through Tunbridge Wells and Sevenoaks which experienced a significant increase in service frequency in the December 2009 timetable. For instance, MOIRA suggests Sevenoaks was served by 285 trains in the May 2009 timetable and by 369 in the December 2009 time table (mostly to or from London). The cascade of rolling stock freed up by HS1 contributed to this change (for instance being responsible for two additional off peak services per hour from Tonbridge to London).

Indicative estimates of the scale of crowding relief, reliability and punctuality[29] and quality[30] improvements suggest they could add benefits of the order of £315m, £85m and £75m over the appraisal period (PV, 2010 prices and values), accounting for approximately 5%, 1% and 1% of total positive impacts, respectively, although, as outlined above, these impacts are considered likely to be conservative as they assume constant levels of benefit per trip throughout the appraisal period.

Finally, the decongestion and accident reduction benefits experienced by road users due to the reduction in traffic caused by mode switch from car contribute an estimated further £825m to £885m (PV) or approximately 15% of benefits.

As discussed above, the net impact of the domestic HS services for passengers are a balance between the benefits of shorter journey times, improved journey opportunities and improved capacity, reliability and quality against the additional cost to users of premium fares. The additional user charges experienced by passengers paying premium fares are estimated to be worth nearly £0.6bn over the appraisal period. From the passengers' perspective, this balances approximately 10% of the total benefits estimated (equating to 30% to 40% of domestic time benefits). However, from the wider societal perspective, the additional cost of the premium fare to passengers is offset by a benefit to Southeastern of additional revenue.

The balance between additional fares costs and time savings for passengers varies by journey and journey purpose and through time. For business passengers, the cost of the premium fare equates to approximately 10% of time savings as they value time savings at a significantly higher level than those travelling for non-business purposes (values of time are three to four times larger for business travellers than those travelling for commuting and other purposes, although tempered to an extent by the fact that business travellers also buy a higher proportion of full price tickets on average). For commuters and those travelling for other purposes, the cost of premium fares equates to approximately 50% of time over the full appraisal period. In earlier years, the proportion of time saving benefit offset by fares increases is greater. The balance changes through time as the real value of time increases faster than the real value of fares[31,] leading to the time savings being worth relatively more to passengers for all purposes in later years.

It is important to note that these calculations are undertaken using standard, appraisal values of time (in line with guidance). In reality, those choosing to pay a premium fare for a shorter journey time are likely to have values of time that fall towards to the top of the range, increasing the relative value of the time savings achieved. This indicates the benefit of having a choice between a faster or a cheaper service and means that the appraisal of the net value of user impacts is likely to be conservative. The sensitivity tests in Section 2.11 provide an indication of the impacts of varying assumptions on values of time.

Overall international passenger benefits are nearly 80% greater than domestic passenger benefits. This reflects the relative volumes of travel, scale of benefit and the fact that international passengers do not have to pay premium fares[32] to access the time savings associated with HS1. However, the balance changes to some extent in later years as forecast international growth is slower than domestic growth.

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[29] Calculating reliability and crowding impacts in detail would require extensive information on the loading and performance of individual trains and the numbers of passengers switching between individual services as a result of HS1. As the data required is not available, to provide an indication of the potential scale of benefits, reliability benefits were calculated by assuming that HS passengers experienced the benefits of less late running and cancellation associated with the above average PPM performance shown by HS services, with an average delay attributed to each PPM fail train based on Office of Rail Regulator information on Cancelled and Seriously Late trains and an assumed distribution for other trains. Indicative crowding benefits were derived using the loading levels at London terminals suggested by the DfT's PIXC data and estimating the impact if the 77% of peak HS passengers into and out of London who report (in the user survey) that they would travel by another train in the absence of HS1 were transferred to the existing peak mainline services (i.e. 7.00 to 10.00 to London and 16.00 to 19.00 from London), assuming changes in loading along the line based on details from the Kent RUS and finally applying PDFH crowding penalties.

[30] Indicative quality benefits were estimated using the PDFH monetary valuations for incremental changes in quality and assuming the additional percentage of passengers identified as being 'Satisfied' with a relevant characteristic in the NPS survey on HS services relative to Mainline services experienced the PDFH value uplift (assuming an even distribution across trip lengths)

[31] The value of time grows in line with forecast GDP growth whilst fares grow at 1% above forecast RPI.

[32] There is no evidence of a distinct change in Eurostar fares levels after the introduction of HS1 so it has been assumed that fares are consistent between the counterfactual and with HS1 scenario.

The geographical distribution of the domestic benefits closely follows the patterns of demand and relative time savings discussed above. Nearly 90% of the benefits are associated with trips into or out of London (including those travelling through). Figure 2.15 below shows the distribution of benefits by the non-London station[33] used on the journey. The largest concentrations of benefits occur at Ashford, Ebbsfleet and Canterbury West, reflecting the combination of large scale of journey time saving and volume of demand. Figure 2.16 shows the equivalent information with the additional disaggregation of category of trip illustrating the proportion of benefits for trips from each station are associated with trips to London, through London or within the HS area. The figures show the dominance of trips to and through London for nearly all stations. The only exception is Stratford International which forms the London end of the journey itself meaning that HS benefits are mainly associated with trips to and from the HS area.

Figure 2.15: Distribution of Benefits by Non London Station (GJT + User Charge)
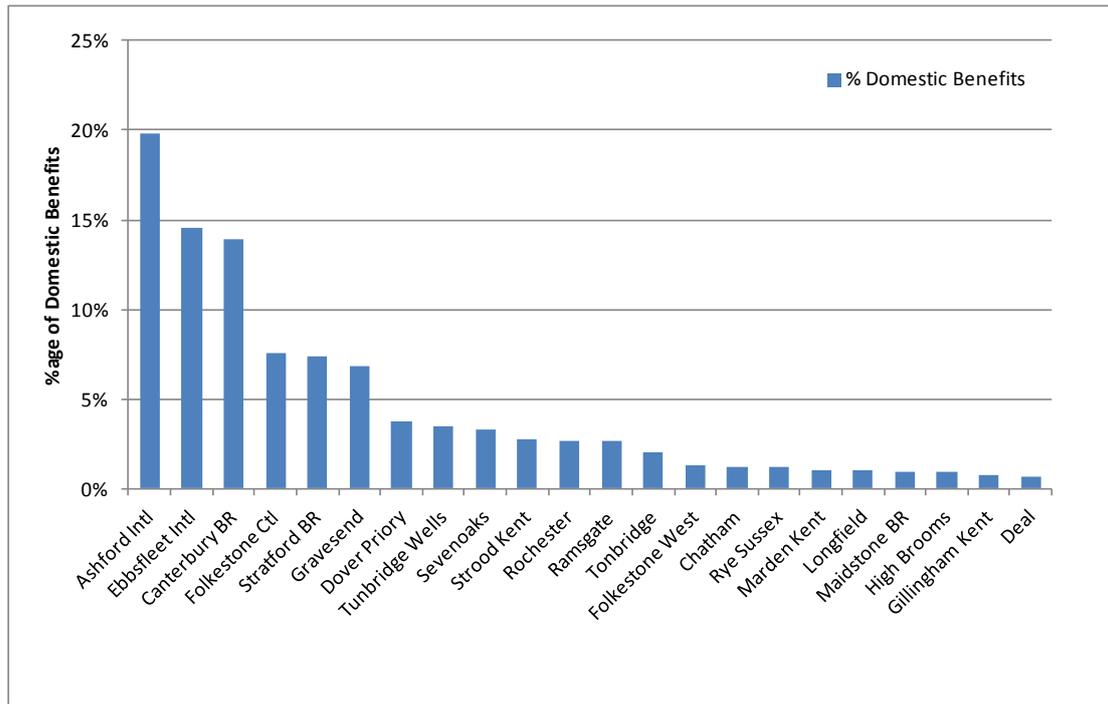
Source: Benefit calculations

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[33] Sharing benefits for journeys wholly outside of London evenly between the two ends

Figure 2.16: Distribution of Benefits by Non London Station and Category (GJT + User Charge)
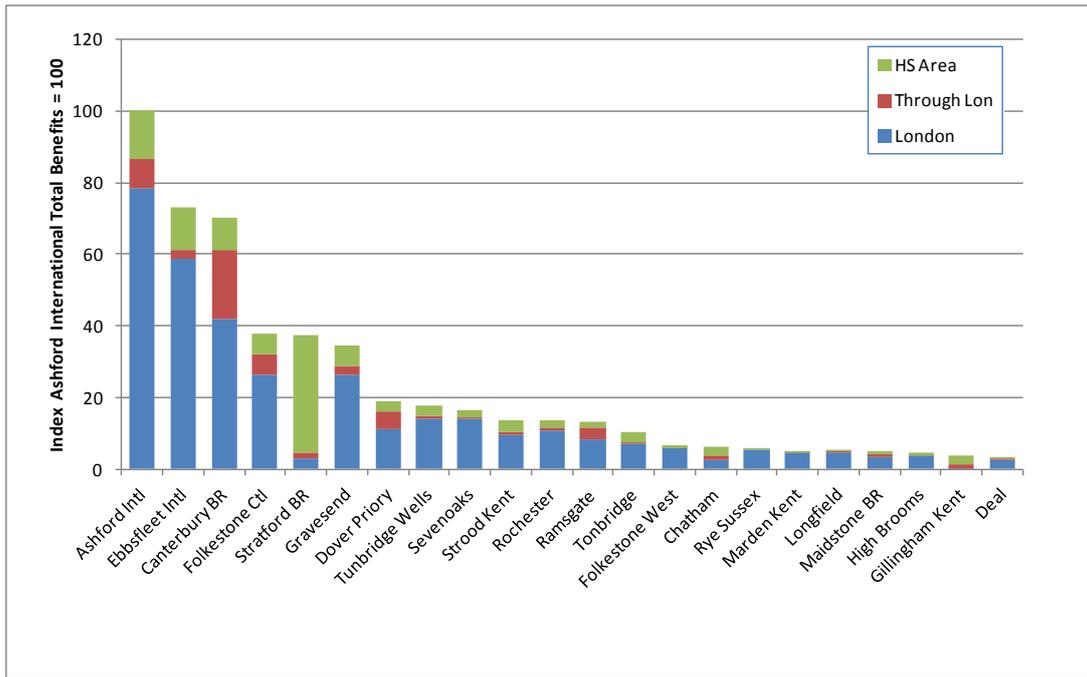
Source: Benefit calculations

2.7. Non User Benefits/Externalities

The previous section described the impacts of HS1 and associated timetable changes on those using the transport network; considering both passengers directly using HS1 and affected train services, and those on the road network, experiencing decongestion as a result of others switching from car use to use rail.

The switch away from car use to rail use also affects others, who are not necessarily transport users, through the reduction in environmental externalities associated with traffic, particularly carbon emissions, local air pollutants and noise. Applying the WebTAG guidance[34] on the typical value of the impacts of removing traffic suggests that the impacts of mode switch from car to the domestic services would be worth approximately £40m to £45m over the appraisal period incorporating both the evaluation and the appraisal elements. Throughout the time period, the majority of the benefits are attributable to the carbon emissions savings resulting from reduced car use).

The user survey responses suggested that the greatest levels of mode switch caused by domestic services had occurred on trips into Stratford International, particularly from Ashford, meaning that the benefits of reduced local emissions and noise are likely to be concentrated along these routes.

These benefits would be offset by increases in noise associated with additional train services (after mitigation) and emissions associated with the generation of electricity required to power the trains. In general, it is beyond the scope of this study to quantify these impacts. However, the carbon emissions associated with electricity generation are part of the ETS trading scheme and therefore would be captured in the electricity costs included in the scheme costing.

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[34] Unit A5.4 - https://www.gov.uk/government/publications/webtag-tag-unit-a5-4-marginal-external-costs

2.8. Revenue Impacts

The impact of HS1 on revenue is the key impact on other transport providers (Eurostar and Southeastern), aside from the costs (to be considered in Chapter 6). Table 2.8 summarises the estimated impacts of HS1 on international and domestic revenue.

Table 2.8: Revenue Impacts
(PV, £m, 2010 prices, appraisal period 2003 to 2069)

Impact	Total	Business	Commute	Other
Estimated Revenue Full Appraisal Period (PV)[35]				
International	4,160	N/A	N/A	N/A
Domestic	1,730	300	990	440
Total	**5,890**			

Revenue over the appraisal period is forecast to increase by an estimated £1.7bn (PV, 2010 prices) on domestic services and by £4.2bn on international services[36]. On domestic services, the increase is the net effect of additional passengers and the premium fare paid by domestic passengers switching from other rail services.

In line with the patterns of demand and benefits identified above, the majority of the increase is on journeys into London, particularly from Ashford and Canterbury (longer distance journeys with higher fares).

An important side effect of the increase in public transport revenue received by operators is a decrease in indirect tax revenue received by government. Public transport fares do not incur indirect tax and therefore appraisal guidance includes the assumption that expenditure transferring to public transport fares reduces government income by transferring away from expenditure on items incurring taxation.

The combined effect of the increased expenditure on fares and decreased use of cars and associated expenditure on fuel (and associated fuel duty and VAT) leads to an estimated reduction in indirect taxation received by government of approximately £825m (PV to 2069, 2010 prices and values).

2.9. Summary of Impacts

Table 2.9 below provides an overall summary of the net present value of the user, non-user and provider impacts of HS1 and associated timetable changes, representing the combination of both observed, evaluated impacts to 2013 and forecast, appraised impacts for 2014 to 2069. The subsequent table (Table 2.10) then provides a written summary of the impacts, setting them in the context of the additional impacts identified by WebTAG as components of comprehensive appraisal of the impacts of a transport scheme on society.

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[35] Appraisal period 2010 to 2069 for domestic services and 2003 to 2069 for international services, with demand and real fares growth capped in 2033, in line with DfT guidance.
[36] Increase in international revenue is estimated on the assumption that the above trend growth in demand evident in the year following the introduction of each HS1 improvement can be considered to be generated by HS1. The proportions identified (10% after Phase 1 and 15% after Phase 2) are consistent with the survey results for the increase associated with domestic services

Table 2.9: Summary of Quantified Impacts
(NPV, £m, 2010 prices and values, appraisal period 2003 to 2069)

Impact	Total
International User Time Savings	2,985
Domestic User Time Savings	1,410-1,925
Domestic User Charge Impacts[37]	-580
Crowding, Reliability, Punctuality & Quality Benefits	475
Road User Impacts: Decongestion Benefits	825-885
Environmental Externalities	40-45
International Revenue	4,160
Domestic Revenue	1,730
Indirect Tax Receipts	-825

Table 2.10: Summary of Other Transport Impacts
(all figures = PV, 2010 prices and values, appraisal period 2003 to 2069)

Impact	Description
Economy	
Business users & transport providers	*Business Users* Significant generalised journey time savings for passengers using the domestic services (£0.70-0.95bn, PV) or Eurostar (£1.8bn PV), reflecting the large journey time savings generated by HS1. Also crowding and journey quality benefits, indicatively (and conservatively) estimated to be in the order of £0.2bn (PV) Domestic passengers have to pay premium fares to access the benefits of travelling on HS1, with the premium on average at least 20% of the non HS alternative fares. To a much more minor extent, the on train time savings are either offset or supplemented by changes in access/egress costs as a result of choice of different station outside London (e.g. rail heading) and/or change in terminal station in London, if relevant. The upper end of the forecast benefits range includes impacts experienced by non HS Southeastern Mainline passengers, reflecting the balance between changes in frequency and stopping patterns and some revised interchange possibilities. Values range up to £0.2bn (PV), depending on the view taken on the degree to which HS1 can be considered directly responsible for all impacts. These effects are also supplemented by small net impacts from a number of other potential sources, scoped out of the quantification process due to their small and/or uncertain character (as explained further in the Scoping Note – attached as Appendix 1): - Net impact on access/egress travel times within London for Eurostar passengers, caused by the relocation of the terminal from Waterloo to St Pancras with the introduction of HS1 Phase 2. This affected people either reaching their ultimate destination in London or crossing London to leave via another terminus. The impact is considered likely to be very limited as some will benefit and others will lose out from the change. The situation was similar for the change in London terminal for domestic HS services and the responses to the passenger survey suggested that the impact of the change in London terminus equated to less than 3% of journey time impacts for domestic HS trips; - Net impact on access/ egress for Non-HS Southeastern services. Likely to be limited as changes to these services are not likely to be sufficiently large to alter passengers' choice of station; - Remaining air and ferry passengers - some potential impact from changes to

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[37] Cost to domestic rail users of paying premium fares, offset by an increase in revenue to Southeastern, included in the domestic revenue entry

Impact	Description
	flight or ferry patterns in response to reduced journey times via HS1. Impacts are limited and difficult to differentiate from larger impacts such as the initial introduction of Eurostar and Eurotunnel and the growth of the low cost air market over the same time period. Cross channel ferry demand shows no discernible change in trend with the introduction of the HS1 phases[38]; - Journey time impacts of changes on other parts of the rail network, made possible by the HS1 changes e.g. Thameslink Herne Hill alteration. These effects are likely to be limited and their nature and scale are uncertain and again difficult to distinguish from much larger influences and changes over the time period; and - Freight impacts. Freight use of HS1 is very limited as evidence suggests speed is relatively unimportant to freight carriers. The HS1 New Operators Guide in February 2013 identified that freight use of the link was restricted to limited night time services, operating at 140kph rather than the possible 300kph and subsidised by government grant. The lack of an appropriate approach for the quantification of the benefits of freight schemes is in any case a recognised shortcoming of current transport appraisal guidance (WebTAG), reflecting the fact that benefits cannot be directly linked to time savings. *Transport Providers* - Significant increases in revenue for Southeastern and Eurostar, also parking revenue for HS1 (operating the car parks at Ashford, Ebbsfleet and Stratford international).
Reliability impacts on Business users	Positive impacts for HS1 passengers as the reliability and punctuality of HS services is considerably above average (resulting in benefits of the order of £10m (PV) over the appraisal period).
Regeneration	*Covered in Chapter 5*
Wider Impacts	*Covered in Chapter 4*
Environmental	
Noise	Small benefit (worth approximately £5m PV) due to a reduction in road traffic (due to mode switch to rail). However, this is offset to an extent by the net noise impacts, after mitigation, associated with the additional HS services and additional speed and rerouting of Eurostar services (quantification is beyond the scope of this study).
Air Quality	Small benefit (worth < £1m PV) due to a reduction in road traffic (due to mode switch to rail). However, it is offset to an extent by the additional emissions associated with the generation of electricity required to power the additional and faster trains (quantification is beyond the scope of this study).
Greenhouse gases	Small benefit (worth approximately £35m PV) due to a reduction in road traffic (due to mode switch to rail). However, it is offset to an extent by the embedded carbon associated with the construction of line, stations and new rolling stock (quantification is beyond the scope of this study). The generation of the electricity required to power the trains also generates carbon emissions but they are covered by the European Trading System and therefore included in the price of electricity included in the costs.
Landscape	
Townscape	*Beyond the scope of this study: Impacts are the net result of construction of new infrastructure and station expansion in rural and urban areas and mitigation measures such as embankments*
Biodiversity	
Water Environment	
Social	
Commuting and Other users	Broadly equivalent to the impacts described for Business Users with GJT benefits of £0.7 - £0.9bn (PV), although the impact of increased fares for domestic users offsets a larger proportion of GJT savings (£0.4bn, PV) from their perspective, due to the lower values of time of non-business passengers. Crowding and journey quality benefits indicatively (and

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[38] DfT, Sea Passenger Statistics Release, 2012

Impact	Description
	conservatively) estimated to be of the order of £0.2 bn.
Reliability impact on Commuting and Other users	Positive impacts for HS1 passengers as the reliability and punctuality of HS services is considerably above average (resulting in benefits worth approximately £45m NPV over the appraisal period).
Physical activity	Minimal impact.
Journey quality	Positive impact as a result of high quality new rolling stock and station environments and reduced crowding (worth £220m (PV) for commuting and other users.
Accidents	Positive impact as a result of reduced car travel (estimated as £70m, PV) offset to a limited extent by additional rail travel
Security	Positive impact as a result of improved station environments
Access to services	Minimal impact
Affordability	Limited impact. New journey opportunities introduced are more expensive, but the cheaper, slower alternatives also remain available.
Severance	*Beyond the scope of this study: Impacts the net result of construction of new infrastructure in and mitigation measures.*
Option and non-use value	Minimal impact – no new modes of transport introduced.

2.10. Sensitivity Tests

2.10.1. Individual Sensitivity Tests

The quantified evaluation/appraisal results set out above rely on a number of sets of input data and assumptions. It is therefore important to understand how sensitive the results are to different assumptions and the impacts of changing them. Consequently, sensitivity tests have been undertaken to assess the impact of varying the following assumptions:

- Proportion of indirect benefits assumed to be attributable to HS1: Two tests assuming 0% and 100% of benefits are attributable respectively, showing the values behind the ranges in Tables 2.7 and 2.9 above;

- Demand growth rates: Three tests assuming annual forecast growth throughout the appraisal period is firstly reduced to 50% of its central value, secondly, increased to 150% and thirdly increased to 200% for international demand (remaining at 150% for domestic demand), reflecting the lower central forecast rates of demand growth for international demand;

- Cap year: Two WebTAG sensitivity tests, assessing the impact of assuming growth is capped in 2023 and 2043 rather than 2033;

- Purpose split: Two tests - assuming the proportion of passengers travelling for business is firstly 50% and secondly 150% of the level implied by the default PDFH assumptions;

- Value of time: The January 2014 version of WebTAG introduced revised values of time based on new research methods, particularly for business journeys. The net result was a 38% reduction in 2010 values of business travel time savings for rail passengers, with a 5%/6% increase in the values of time for commuting and other purposes (and an increased rate of growth through time). Forecast rates of growth in real GDP (and therefore values of time) were also adjusted, in line with Budget updates. The NAO evaluation used the previous values of time. Therefore, to facilitate comparison, the final column in the table below shows the results of applying the previous WebTAG values of time;

- Proportion of domestic HS trips assumed to be new to rail (influencing the amount of user benefits they are assumed to accrue and amount of additional revenue they generate) – Two tests assuming 50% and 150% of the proportion implied by the survey results, respectively; and

- Rate of real growth of fares: Test assuming fares grow with RPI (rather than RPI + 1%), in line with the observed pattern in recent years.

Table 2.11 presents a summary of the quantified impacts by sensitivity test. To reduce the number of sets of results presented, the tests are based on a 'central' case in relation to domestic user time savings, assuming that 50% of the indirect benefits are attributable to HS1.

The results show that the impacts of other Southeastern timetable changes occurring in December 2009 were significant and positive. As discussed above, this is largely the result of improved frequency on the line through Tonbridge, Tunbridge Wells and Sevenoaks. If half of these and other wider timetable change impacts are considered directly attributable to HS1 they contribute just over 10% to total domestic user time benefits.

The results are also sensitive to assumptions made on growth in demand. The value of time savings are forecast to increase through time (in line with GDP) and therefore additional demand in later years adds significantly to the net benefit of the scheme. This is partly because the extent to which premium fares offsets time savings decreases through time (as real value of fares decreases more slowly than values of time).

Similarly, the test assuming a higher percentage of passengers travelling for business purposes results in a larger net benefit and a lower proportion of time savings offset by the premium fares because the standard appraisal value of time is 3 to 4 times higher for business travellers than for those travelling for other purposes.

The net effect of applying the previous version of WebTAG values of time to the appraisal is to increase the value of combined domestic and international travel time savings by nearly 25% and crowding, reliability, punctuality and quality benefits by over 10%, reconfirming the significance of value of time assumptions to the result of the evaluation/appraisal result.

Varying the assumption on the proportion of domestic HS passengers who are assumed to be 'new to rail' (i.e. would use another mode or not travel in the counterfactual) by 50% in either direction alters the scale of domestic rail user benefits by about 7%. Benefits increase as the proportion who are new to rail decrease because those who would travel by rail in the counterfactual are assumed to experience the full change in journey costs associated with HS services whereas those transferring to rail are assumed to experience half (in line with the 'rule of half' approach to economic assessment, set out in the Scoping Note).

Varying the assumed proportion also has a significant impact on highway decongestion benefits which increase in proportion to the number of trips switching from car to rail as a result of HS1. Similarly, revenue generation (and the associated impact of indirect tax revenue decrease) increases as the proportion of HS passengers who are assumed to travel by other modes or not travel in the counterfactual increases. The revenue generated for each new trip is equivalent to the total fare whereas the revenue generated for those who would travel by rail in the counterfactual is limited to the differential between premium and standard fares. Revenue generation is therefore approximately 30% higher if the number of new to rail trips is increased by 50% and about 30% lower if the number is decreased by 50%.

Reducing the rate of growth in real fares reduces the revenue income received from the services although this disbenefit is offset by a decrease in the user costs of fares experienced by those switching to rail from other modes or paying the premium HS fares and the loss in indirect tax experienced by government (as less expenditure on fares should lead to greater expenditure on goods incurring indirect taxation).

2.10.2. Combination of Sensitivity Tests

The individual sensitivity tests outlined above are not mutually exclusive and it is possible to identify future scenarios in which combinations of the effects tested would apply, either mutually reinforcing each other in terms of effect or acting to offset each other. Table 2.12 summarises the economic results for two combined sensitivity tests, assuming a combination of mutually reinforcing changes in some of the variables tested.

The high growth scenario reflects a high demand scenario in which HS services particularly attract business travellers (or others with high values of time). As an illustration this is assumed to lead to growth of 200% of the central case assumption, continuing to 2043, with business passengers accounting for 150% of the central proportion. Conversely, the low growth scenario represents a low demand growth scenario in which HS services are particularly attractive to non business travellers. Again as an illustration this is assumed to be reflected in growth of 50% of the central case stopping in 2023, with business passengers accounting for 50% of the central proportion.

However, it is important to note that these tests represent an illustration of the cumulative impacts of a combination of pessimistic or optimistic assumptions in relation to future scenarios. They do not reflect minimum and maximum possible levels of benefits, as the individual sensitivity tests were defined to represent a plausible range of values to illustrate the relative sensitivities of benefits to key identified variables, rather than representing maximum and minimum feasible values. However, the size of the range highlights the importance of the assumptions made in relation to certain key future variables, particularly when possible variations are considered cumulatively.

Table 2.11: Summary of Quantified Impacts by Sensitivity Test (NPV, £m, 2010 prices, appraisal period 2003 - 2069)

Impact	Central (50% indirect)	0% indirect benefit	100% indirect benefit	2023 growth cap	2043 growth cap	50% annual demand growth	150% annual demand growth	150%/200% annual growth[39]	50% default business %age (of demand)	150% default business %age (of demand)	Previous WebTAG value of time	50% central 'new to rail' trips[40]	150% central 'new to rail trips'	Fares growth – RPI+0%
International User Time Savings	2,985	2,985	2,985	2,840	3,120	2,800	3,185	3,405	2,260	3,710	3,735	2,985	2,985	2,985
Domestic User Time Savings	1,680	1,410	1,925	1,420	1,865	1,380	2,055	2,055	1,350	2,010	1,990	1,790	1,570	1,680
Domestic User Charge Impacts	-580	-580	-575	-460	-660	-495	-680	-680	-570	-585	-580	-610	-550	-500
Crowding, Reliability & Quality Benefits	475	450	450	405	520	395	570	570	395	525	540	505	445	475
Road User Impacts: Decongestion Benefits	870	825	885	715	905	710	1,075	1,075	870	870	870	435	1,310	870
Environmental Externalities	45	40	45	35	45	35	55	55	45	45	45	20	65	45
International Revenue	4,160	4,160	4,160	4,005	4,280	3,955	4,385	4,665	4,160	4,160	4,160	4,160	4,160	4,160
Domestic Revenue	1,730	1,730	1,730	1,365	1,930	1,465	2,055	2,055	1,730	1,730	1,730	1,235	2,225	1,490
Indirect Tax Receipts	-825	-755	-785	-745	-865	-750	-910	-945	-1,015	-720	-825	-710	-940	-790

[39] Domestic demand growth of 150% central rate, international demand growth of 200% central rate

[40] Varying the proportion assumed to be new to domestic rail, international figures unchanged as derived through a different calculation process

Table 2.12: Summary of Quantified Impacts for Combinations of Sensitivity Test

(NPV, £m, 2010 prices, appraisal period 2003 - 2069)

Impact	Central	Lower Combined Test	Upper Combined Test
International User Time Savings	2,985	2,060	4,645
Domestic User Time Savings	1,680	1,030	3,880
Domestic User Charge Impacts	-580	-410	-1,030
Crowding, Reliability & Quality Benefits	475	310	1,010
Road User Impacts: Decongestion Benefits	870	645	1,145
Environmental Externalities	45	35	60
International Revenue	4,160	3,865	4,940
Domestic Revenue	1,730	1,230	2,950
Indirect Tax Receipts	-825	-875	-940

2.11. Land Use Change, Feedback Effects and the Evaluation of Transport User Benefits from HS1

2.11.1. Introduction

The evaluation/appraisal outlined above makes the assumption that the underlying socio-economic geography of the South East has not been changed by the introduction of HS1 – so businesses and people have not relocated (homes or jobs) because of the introduction of the scheme.

In this way HS1 is assumed to only effect:

- The route people take for existing journeys;
- The mode people choose to use; and
- The frequency which people who already live and work in the locations choose to travel (on HS1 and beyond).

However, transport interventions can have significant impacts on the underlying structure of the local economy, which in turn can feedback into travel demand and so the benefits that transport users enjoy as a result of the scheme. An example would be a business or individual choosing to relocate near to an HS1 station so that they can take advantage of the improved connectivity offered by the scheme. In this instance it is not existing households, workers or businesses changing their choices about how to travel, rather there are now more people who would use HS1 and gain some benefits from the scheme.

Analysis of economic data (discussed in Chapter 4) has not provided conclusive evidence of these changes to the socio economic geography of the region. As a result, the evaluation of transport user benefits has assumed that this has no impact on demand or benefits of the scheme. However this assumption is uncertain, and it is therefore important to consider the sensitivity of results to varying this assumption.

2.11.2. Benefits for People and Businesses Who Change Locations

The theoretical principles that underpin the valuation of benefits for transport users were set out in the Scoping Note. This describes the standard Rule of Half approach to transport appraisal, which relies on the assumption that the locations of trip origins and destinations remain unchanged by the implementation of a scheme. By applying this assumption, the assessment above therefore complies with WebTAG .However valuation becomes more complex when considered in the context of people or businesses that change location as a result of a transport intervention.

Location decisions are a complex trade-off between many different factors. For individuals this might range from the cost (and journey time) of travel to work, cost of housing and the quality (e.g. size) of housing available, through to personal characteristics such as proximity of family and friends. Businesses have similar choices around access to workers and their product markets through to quality of the available commercial property, even down to whether the location provides the right 'image' for the company or industry they work in.

If an individual or business decided to relocate as a result of the improved connectivity offered by HS1, the benefits are unlikely to be only transport related. For example, an individual may choose to relocate further from London; taking advantage of the faster journeys on HS1 not to save time, but to unlock other benefits such as a larger house, live in a more rural location or any number of other factors which an individual may perceive as a benefit.

In this sense the change in travel costs or time is not indicative of the value of benefits to the individual or business. The benefits of the scheme may not be taken in terms of cheaper or shorter transport trips, rather these benefits may be traded off against other considerations in location decisions – which cannot be observed or easily valued.

Whilst this is a complex system, under certain conditions it is possible to place a value on the benefits of HS1 for people who choose to relocate. Provided individuals and businesses face the same choice set when considering location decisions as they would do in the counter factual without HS1, then the Rule of a Half (as outlined in the Scoping Note) can be applied.

This reflects a simple approach to understanding the potential scale of direct benefits to people who move house or employment as a result of HS1. However it should be noted that this only reflects the direct impacts, and not the potential knock on impacts of land use change. These indirect effects are complex and result in both benefits (e.g. regeneration of an area) and disbenefits (e.g. greater congestion in the local area).

There is currently no simple way (within the scope of this project) to quantify these impacts. However, as Chapter 4 describes, the analysis of regeneration effects has not identified any significant indirect effects from HS1 yet (although it has created the conditions for future development), suggesting that – at the moment at least – these impacts are likely to be small.

2.11.3. Implication of Location Changes on Current Patterns of Demand

The evaluation of transport user benefits has assumed that HS1 has not had an impact on the socio-economic geography of the region, and that there is no associated feedback into demand. If this is wrong, then the evaluation will be overestimating demand from stations served by HS services in the counter factual (e.g. Ashford, Ramsgate) and also overestimating benefits.

The evaluation assumes that everyone travelling between, say, Ashford and London today would have considered completing a similar journey even if the scheme had not been built. Based on survey responses, 75% of these would have chosen to use rail for this journey in the absence of HS1. All of these passengers are therefore assumed to receive the full benefit of the time saving from HS1.

However, if any of these passengers have actually chosen to relocate as a result of HS1, the evaluation should only count half of the benefits (as discussed above). Hence for these passengers the evaluation is potentially overstating the benefits of the HS1 – it is ignoring the potential trade-offs and other choices individuals and businesses make when deciding to relocate.

Analysis of survey responses indicates about 50% of respondents had moved house and/or job since 2009, and of those, 30% (18% of respondents) said that HS1 had been a factor in their choice of location. This does not mean these people would not have moved if HS1 hadn't been built and cannot be taken as conclusive evidence of land use change as a result of the scheme. However it does give a view of the potential scale of relocation decisions as a result of HS1.

Assuming that the 18% of passengers using HS1 have changed the location as a result of HS1, would result in the evaluation of transport user benefits being £70m lower (2010 prices/values, NPV over 60 year appraisal period) than those reported in Section 2.9 above, approximately 7% of the total. This impact is the net impact of £115m reduction in time savings and £45m reduction in user charge losses.

2.11.4. Implications of Future Changes in Economic Geography and Feedback Effects

Analysis of the available evidence on socio-economic changes has found no conclusive evidence of HS1 changing the economy in the South East (as discussed in Chapter 4). However interviews with stakeholders and other evidence suggest this may be due to the economic downturn which has resulted in some inertia within the region. In other words HS1 may not have affected location decisions or economic geography of the South East yet, but that does not mean it would not affect it in the future.

If there is land use change attracting business, jobs or new households to the areas along the HS1 corridor in future, then the forecasts of demand – and so benefits – will be too low. Whilst there is no evidence to suggest the scale of this potential impact, it is possible to identify how sensitive the benefits are to the change. The table below (Table 2.13) shows how the annual domestic user benefits associated with trips to and from London would change in 2012/13 as a result of a 1% change in employment, population and economic growth in the catchment area for three example stations.

Table 2.13: Illustration of Change in User Benefits Associated with Feedback Effects
(% of 2012/13 domestic user benefits by journey)

Impact	1% change in Population	1% change in Employment	1% change in GDP per Capita
Ashford – London	0.51%	0.01%	0.24%
Ebbsfleet - London	0.50%	0.00%	0.38%
Ramsgate - London	0.55%	0.01%	0.31%

Impacts were assessed by using relevant PDFH elasticities to identify the implied change in HS demand on journeys to and from each station as a result of the changes identified and including the additional demand in the Rule of Half calculations for benefits for the station.

The results suggest that, in terms of transport user benefits and passenger demand on HS1, these feedback effects are unlikely to have a significant effect on the overall quantified benefits of HS1. The impact of employment change is particularly limited as the PDFH elasticities suggest employment affects commuting trips attracted to a station, whereas all three stations are primarily generators of commuting trips to London (over 95% of commuting trips in each case).

It is important to note that this analysis does not take account of the indirect costs and benefits of such changes (such as regeneration) which could be far more significant to the local community.

2.12.   Summary

The introduction of HS1 and associated revisions to Eurostar and Southeastern timetables, including the introduction of domestic HS services, have bought substantial time savings for a significant number of rail passengers on both domestic and international services.

From the passengers' perspective the time benefits on domestic services are partially offset by the requirement to pay a premium fare. Using the standard appraisal values of time, the fares increase offsets approximately 30% to 40% of domestic time benefits experienced by passengers on average over the appraisal period. This balance would change if passengers were considered to have a higher value of time. At a wider societal level the cost to passengers of increased fares is offset by the benefit to Southeastern of increased revenue.

The user survey indicated that passengers on the domestic HS services were travelling to and from a wide geographic area. However, the benefits are dominantly focussed on trips into and out of London and, particularly on trips from Ashford International, Ebbsfleet International and Canterbury West stations reflecting high volumes of passengers and large time savings.

30% to 45% of savings are Direct (i.e. from journeys wholly on HS1 e.g. Ashford to St Pancras), 45% to 55% of savings are Secondary (i.e. from journeys using classic rail to access HS1 e.g. Canterbury West to St Pancras) and 0% to 20% are indirect (on other elements of the Southeastern network), depending on the proportion of other Southeastern timetable changes in December 2009 are considered directly attributable to HS1.

Other more minor impacts of HS1 and associated timetable changes include crowding relief, reliability, punctuality and journey quality improvements and benefits to road users and the rest of society of reductions in road use.

The results are sensitive to a number of assumptions, particularly on passenger growth and values of time and purpose split.

3. Wider Economic Impacts

3.1. Introduction

This evaluation of HS1 includes considerations of its Wider Economic Impacts. Wider Economic Impacts should be distinguished from the benefits of HS1 for the users of transport services and the regeneration type benefits it can bring to its catchment area. The benefits of HS1 for transport users, both individuals and businesses, and for the firms that provide transport services are identified and quantified in Section 2. HS1 may also have the effect of bringing additional economic activity and employment opportunities to the catchment area it serves. This type of impact typically represents a displacement of activity or employment opportunities from outside the catchment area of the transport service in question. As a result it is not a net benefit to the economy as a whole and it is typically excluded from the cost benefit assessment of a transport investment. These regeneration effects of HS1 are identified and quantified in Section 4 of this Report.

This Section of the report deals with the effects of HS1 that lead to net increases in economic activity or welfare. Transport services have positive externalities that can lead to greater productivity, and hence output, in markets for goods and services. In addition, transport services are an important input for the markets for labour, goods and services. A reduction in the cost or increase in the quality of transport services can therefore lead to increased output in these markets. As these markets do not operate in conditions of perfect competition this increased output leads to net increases in economic welfare.

These Wider Economic Impacts are recognised as an important benefit of transport investments. They cannot be directly observed. The firms and individuals involved will not necessarily be aware of their extra productivity or that it comes from better transport links. Techniques have been developed to estimate the Wider Economic Impacts of a proposed transport investment for appraisal purposes. These are now included in the DfT WebTAG appraisal guidance, and are described below.

Sub section 3.2 below explains, using a Logic Map, the Wider Economic Impacts that were identified and measured for this study. This is followed by a summary description of the approach to measuring these benefits adopted for this study. Full details of the approach adopted are set out in Appendix A to this study. Finally, the results obtained are reported.

3.2. Wider Economic Impacts

The Logic Map prepared for the investigation of the Wider Economic Impacts of HS1 is set out in Figure 3.1 overleaf. This Logic Map describes, in the context of HS1, the four types of Wider Economic Impact that a major transport infrastructure investment such as this might have on the economy. These are:

- Agglomeration effects on productivity;
- Labour Market Effects:
    - Encouraging people to enter the labour market; and
    - Allowing people to move to more productive jobs.
- Expanded output in imperfectly competitive markets.

Agglomeration benefits arise from the increase in productivity that comes with increases in the level of concentration of economic activity. These productivity benefits from greater concentrations of economic activity were first noticed in studies of the economic performance of cities. In general firms in larger cities, with greater concentrations of individuals and business, are more productive than firms in smaller towns and cities or in rural areas. These productivity benefits come from having access to:

- Larger labour markets providing access to a specialised labour force;
- Larger product markets providing a bigger potential market for their production; and
- A broader range of other firms providing specialist inputs and services and acting as potential partners and sub-contractors.

The transport benefits of HS1 arise from shorter journey times and greater frequencies of service. These reduce the generalised costs to individuals and firms of making journeys. These improvements in journeys

reduce the effective distances between firms and individuals in the areas served by HS1. This will give rise to the type of agglomeration effect described above. These reductions in effective distances will bring firms closer to potential customers, employees and partners, giving them access to larger labour and product markets and to a greater range of potential suppliers and partners. HS1 will bring firms the benefits normally associated with being part of a larger, denser area of economic activity.

Equally the reduction in effective distance between firms and individuals will encourage additional people to enter the labour market. In standard cost benefit terms, the decision of an additional person to enter the labour market has welfare benefits from the additional output produced by that person but a welfare cost equal to the effort and lost leisure contributed by that person. The economic value of the output from an additional member of the labour force is the "value added" from that person's production, which will be equal to the full cost of employing that person to the employing firm. The economic value of the cost to the employee of their lost leisure is the net income they gain by taking up employment. Therefore the "tax wedge" between the gross cost of employing an additional person and the net income of that person, broadly equivalent to payroll taxes on the employer and income taxes paid by the employee, represents a net welfare gain to society as a whole.

Lower effective distances may also allow people who were already active in the labour market to travel further for work and take up opportunities to take on more productive jobs that offer them a higher income. The additional "tax wedge" from such decisions will also represent a net welfare increase for the economy as a whole.

Finally, the majority of markets for goods and services operate in conditions of less than perfect competition. As a result the level of production in these markets will be lower than the socially optimal level that would be reached under conditions of perfect competition. Increasing output in these markets leads to additional consumer surplus and producer surplus and so to net increases in total economic welfare. Transport costs, comprising fares and travel time, are a cost to firms, and the reduction in these costs as associated with a transport investment will reduce the cost of firms that produce other goods and services. When a profit maximising firm's costs are reduced it will normally respond by increasing its output. The additional producer and consumer surplus from this increased output will represent a net increase in economic welfare. In this way the reduction in transport costs from the introduction of HS1 will lead to increased output from firms using HS1 and so to net economic welfare benefits.

Figure 3.1: Wider Economic Impact Logic Map

INTERVENTION: HS1 SCHEME

- New 109km high speed line connecting St Pancras International in London to the Channel Tunnel at Ashford in Kent (Section 1 opened Sep 2003; Section 2 opened Nov 2007).
- High quality station environments at St Pancras, Stratford (7 mins), Ebbsfleet (17 mins), and Ashford (37 mins), with additional parking and retail provision.
- Eurostar high speed trains and services to the continent; domestic high speed trains (Class 395) and high speed services to Kent; domestic high speed premium fares and slightly higher fares on other Southeastern services. (linked to overall improvement in reliability across the Southeastern network).
- Relocation of international London Eurostar terminus from Waterloo to St Pancras.
- New high speed services between London - Stratford - Ebbsfleet - Ashford - North and East Kent.
- Major revision of Southeastern timetable (Dec 2009) affecting Mainline and Metro services.
- High speed rail freight capacity between London and Kent.

Change in Demand (see Transport Outcomes)

OUTPUT: CHANGE IN SUPPLY

Net change in generalised cost (supply) across domestic HS network:
- Taking account of freq/journey time/reliability and crowding/fares.
- Business, commuter and leisure travel

Demand on HS network
- Business, commuter and leisure travel

FEEDBACK LOOP

Change in land-use / Increase in employment opportunities and commuter and business travel associated with Wider Economic Impacts.

Generates additional trip demand, above that derived purely from change in supply / generalised cost.

Net change in generalised cost (supply) other Southeastern services:
- Taking account of freq/journey time/reliability and crowding/fares.
- Business, commuter and leisure travel

Demand on other Southeastern services
- Business, commuter and leisure travel

Net change in generalised cost for car and HGV users:
- Taking account of journey time and vehicle operating costs.
- Business, commuter and leisure travel

Demand on SE road network
- Business, commuter and leisure travel

Net change in generalised cost for business and commuter travellers, weighted by O-D demand across the SE (rail + car)

OUTCOME: WIDER ECONOMIC IMPACTS

Agglomeration benefits

Net change in generalised cost for commuters and business travel, weighted by O-D demand across the SE (rail + car)

Increases the proximity of existing businesses to each other, and to potential employees Measured as change in 'effective density' for different employment sectors.
Other inputs include:
- Baseline (without HS1) employment data (no. of employees) by employment sector, for districts across the South East (DfT data)
- Productivity rates (GDP/head) by employment sector (DfT data)

Businesses able to interact more effectively with each other and have greater choice of inputs (suppliers, labour) and potential markets. Increases productivity of existing businesses., resulting in more jobs and more commuter and business travel
Other inputs include:
- Elasticity of change in productivity to change in 'effective density' by sector (DfT data).

Increase in GDP within the SE (i.e. the value of the goods and services produced by all sectors of the economy).

Labour market impacts

Net change in generalised cost for commuters only, weighted by O-D demand across the SE (rail + car)

More people in Kent/Ebbsfleet encouraged to join the labour market, as a result of the reduction in generalised cost associated with commuting to London or Ebbsfleet (assuming journey time/freq benefits outweigh fare increase)
Other inputs include:
- Elasticity of labour market participation to change in commuting costs (from DfT)
Expected to be a relatively minor outcome.

More rail commuters and increase in earnings in SE

Other inputs include:
- Change in number of commuters * Average anticipated salary

Reduction in unemployment rate in SE

Output change in imperfectly competitive markets

Net change in generalised cost for business travel, weighted by O-D demand across the SE (rail + car)

In most cases, markets are not 'perfectly competitive' and this can lead to lower production and higher prices than would exist in the case of a competitive market, normally to the detriment of consumers and the economy as a whole. A reduction in transport costs (to business and/or freight) allows for an increase in production or output in the goods or service markets that use transport.

A transport intervention that leads to an expansion of output will deliver a welfare gain as consumers of the goods and services will value any increases in production by more than the cost of the additional units of production. This constitutes a welfare gain not appraised within other user benefits.

Calculated as 10% of net change in generalised cost for business travel.

Move to more or less productive jobs

Net change in generalised cost for business travel and commuters, weighted by O-D demand across the SE (rail + car)

More businesses and workers incentivised to locate in HS1 corridor from areas of lower productivity.

Jobs relocated from Kent to London, where productivity is higher due to higher levels of agglomeration (effective density). Workers incentivised to relocate from jobs in Kent to higher paid jobs in London.

Increase in GDP within the SE (i.e. the value of the goods and services produced by all sectors of the economy).

Subsequent impacts on welfare and well-being.

NET IMPACT ON GDP IN SE ALSO DEPENDENT ON IMPROVED BUSINESS PERFORMANCE AND INCREASED EMPLOYMENT BENEFITS IN KEY LOCATIONS RESULTING FROM REGENERATION BENEFITS.

Greater firm productivity, output and competitiveness. Increased regional output (GDP). Increased regional efficiency. Subsequent impacts on welfare and well-being.

Increase in commuter and business travel

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3.3. Approach to Measuring Wider Economic Impacts

Wider Economic Impacts cannot be observed directly, even after an investment has been made. In addition the Wider Economic Impacts of an investment such as High Speed 1 will be spread over its whole useful life. The approach to estimating the Wider Economic Impacts of High Speed 1 for this study follows the guidance and standards set by the DfT for the estimation of Wider Economic Impacts in an appraisal context. The current DfT standards for the estimation of Wider Economic Impact are set out in a TAG Unit published in January 2014[41], however this builds on earlier publications and draft guidance from the DfT which were consulted when this study was being planned and carried out. The DfT has also developed a software application (WITA) and supporting data sets which implements the approach and parameters set out in its guidance.

Set out below is a summary of the approach adopted to the calculation of:

- Agglomeration benefits;
- Output changes in imperfectly competitive markets; and
- Labour market effects.

3.3.1. Agglomeration Benefits

Agglomeration benefits are quantified based on:

- Measurements of the effective density of the affected area with and without the transport investment in question;
- A parameter value for the elasticity of productivity with respect to effective density; and
- Current levels of economic activity in the affected area.

The key element in calculating the Agglomeration Benefits of HS1 is to develop a measure of effective density for the with HS1 and counterfactual scenarios. Effective density measurement requires measurement of the zone to zone average generalised cost of travel for both rail and road in the HS1 and counterfactual scenarios. For this study the "with HS1" effective density was calculated based on a detailed set of data on current traveller behaviour. This data had been assembled to prepare a model to examine the potential impacts of a HS2. An equivalent picture of traveller behaviour in a hypothetical "without HS1" situation was needed in order to calculate effective density in the counterfactual.

For the work on Transport User Benefits, described in Section 2, detailed primary research and analysis was carried out to identify the effect of HS1 on travel behaviour. The results of this work identify the differences in travel behaviour between the current situation and a counterfactual situation without HS1. These results and the picture they gave of travel behaviour in a without HS1 counterfactual were used to derive a description of travel behaviour in the counterfactual. This was used to calculate a measure of effective density in the counterfactual.

These calculations of effective density and ultimately of agglomeration benefits were carried out using the WITA application.

3.3.2. Estimating Output Change in Imperfectly Competitive Markets

In line with the standard WebTAG methodology this benefit was estimated as 10 per cent of the value of user benefits for business journeys. This 10 per cent value was arrived at by the DfT for use in the WebTAG guidance based on research into price cost margins and the elasticities of demand observed in markets for goods and services[42].

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[41] Department for Transport, TAG Unit A2.1 Wider Impacts, January 2014. Available at www.gov.uk/tranport-analysis-guidance-webtag
[42] Further details of the research used by the DfT are available from a discussion paper on "Wider Economic Benefits" published by the DfT in 2005.

3.3.3. Labour Market Effects

The value of the Labour Supply Impact of HS1 was calculated based on:

- The change in generalised costs of travel for commuters as a result of the HS1 investment;
- The impact of this change in cost on the overall amount of labour supplied; and
- The additional output and tax wedge from this additional work.

This calculation was carried out using the WITA application and the information on the effect of HS1 on travel behaviour compared to the counterfactual that was developed for the Transport User Benefits Workstream.

The potential effect of HS1 on individuals' decisions on where to live and work is considered in Section 2.11 above. There is no evidence that this type of effect, where HS1 might change individuals' decisions on where to live or work, will be material in the context of the other benefits of HS1. Accordingly no value has been placed on the potential benefit of individuals moving to more productive jobs as a result of HS1. As is described in more detail in Section 2.11 the survey of domestic High Speed 1 users suggested that only 18% had been influenced in moving house and/or job by HS1. Some of these moves as a result of HS1 may have given rise to positive labour market effects, which are not included in this estimate of Wider Economic Impacts. However, this is offset by the exclusion of their effect on transport user benefits, i.e. If Wider Economic Impacts are in fact marginally understated, then Transport User Benefits will be overestimated by a similar amount.

Table 3.1 below summarises the data sources that were used for the valuation of Wider Economic Impacts.

Table 3.1: Wider Economic Impacts Data Sources

Data Requirement	Source
Effective density - This measurement requires measurement of the zone to zone average generalised cost for both rail and road in the 'with' and counterfactual scenarios.	**With HS1** HS2 Model Outputs in the form of skims for travel time, distance, charges and demand based on PLD zone system. **Counterfactual** Adjusting this detailed picture of the "with HS1" situation based on the primary research to identify the effect of HS1 carried out to identify Transport User Benefits.
In order to estimate the Output Change in Imperfectly Competitive Markets, the Business User Benefits are required.	Transport User Benefit Stream
The elasticity of labour supply with respect to the net return from working	Sourced from the DfT Wider Impacts data set, supporting the WITA model
Number of workers living in each zone and their working destination zone	Sourced from the DfT Wider Impacts data set, supporting the WITA model
Tax take and GDP per worker parameters.	Sourced from the DfT Wider Impacts data set, supporting the WITA model
Earnings in each zone will be obtained from the Economic Data set.	Sourced from the DfT Wider Impacts data set, supporting the WITA model

3.4. Results

As described above values were calculated for the agglomeration benefits of HS1, the benefits of an increased labour supply as a result of HS1 and the effect of reducing travel costs on markets for goods and services characterised by imperfect competition. The WITA application was used to calculate these benefits in terms of 2010 prices. A present value of these benefits over a 60 year appraisal period was then calculated. The results of this exercise are set out in Table 3.2 below.

Table 3.2: Breakdown of Wider Economic Impacts of HS1 (£'000s)

Year		2010	2026	2036	Full
Agglomeration	Manufacturing	£1,495	£850	£571	£42,285
Agglomeration	Construction	£1,762	£1,008	£668	£49,753
Agglomeration	Consumer	£4,543	£3,251	£2,559	£165,992
Agglomeration	Producer	£16,277	£14,357	£12,764	£755,524
Agglomeration	**Total**	**£24,077**	**£19,467**	**£16,562**	**£1,013,555**
Labour supply impact		1,088	920	827	42,933
Increased output in imperfectly competitive market					271,750
Total		**£25,165**	**£20,387**	**£17,390**	**£1,328,237**

The total present value of Wider Economic Impacts is a benefit of £1,328m. This is between 23 and 25 per cent of the value of the Transport User Benefits identified in this study. This is consistent with experience in other studies, where Wider Economic Impacts are generally found to have between 10 per cent and 30 per cent of the value of Transport User Benefits[43]. This reflects consistent application of this methodology for the estimation of Wider Economic Impacts. For sensitivity testing purposes, this value would be closely correlated with the value of transport user benefits.

As one might expect the agglomeration benefits are concentrated in the producer services industries such as professional and financial services which are such a significant part of the economy of the Greater London Area. Figure 3.2 illustrates how almost 75 per cent of the agglomeration benefits of HS1 arise in this sector of the economy.

Figure 3.2: Agglomeration Benefits by Sector

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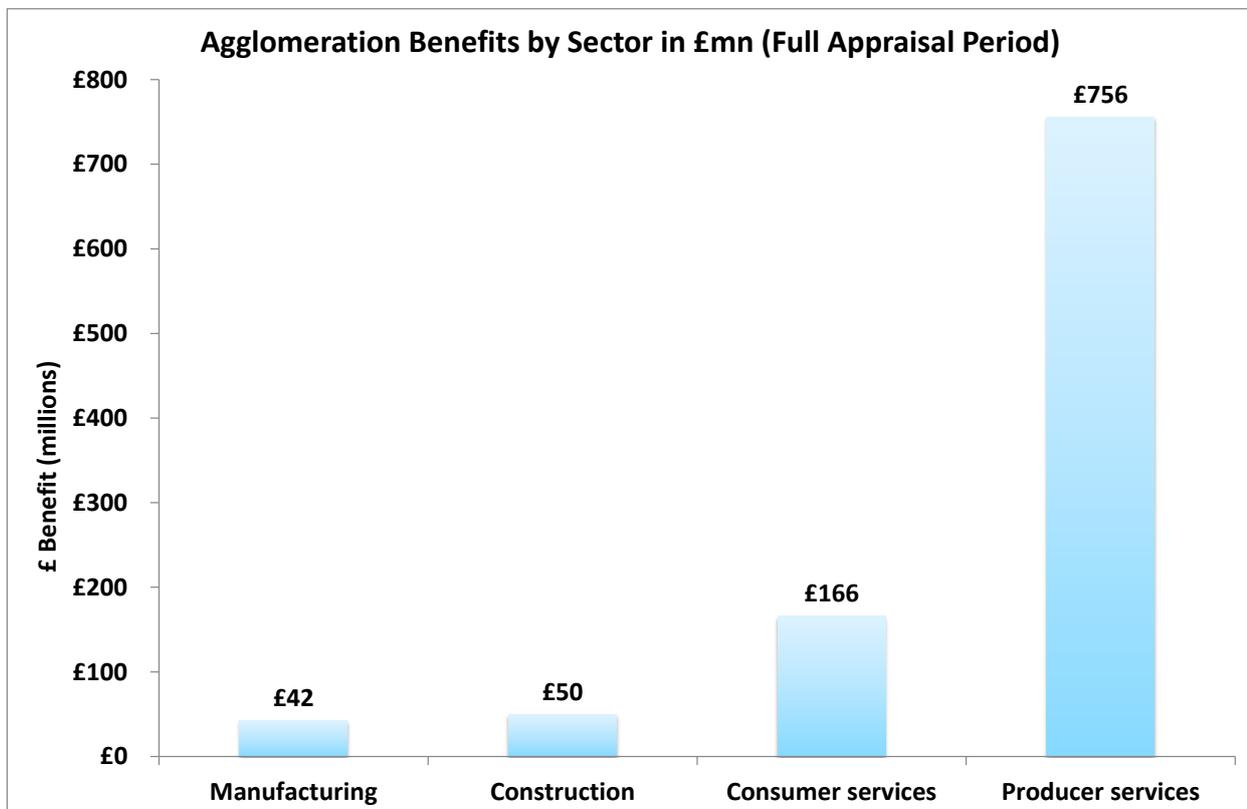
[43] This range is quoted in the WebTAG guidelines which refer to Feldman et al "Use of integrated transport land use models in the wider economic benefits calculations of transport schemes" Paper presented at 87th Transportation Research Board Annual Meeting, 2008.

The calculations take account of decreases in the impact of HS1 on agglomeration over time as its significance grows less in a growing region. The value of the effect was modelled in 2010, 2026 and 2036 as illustrated in Figure 3.3 below.

Figure 3.3: Changes in Agglomeration Benefits over Time
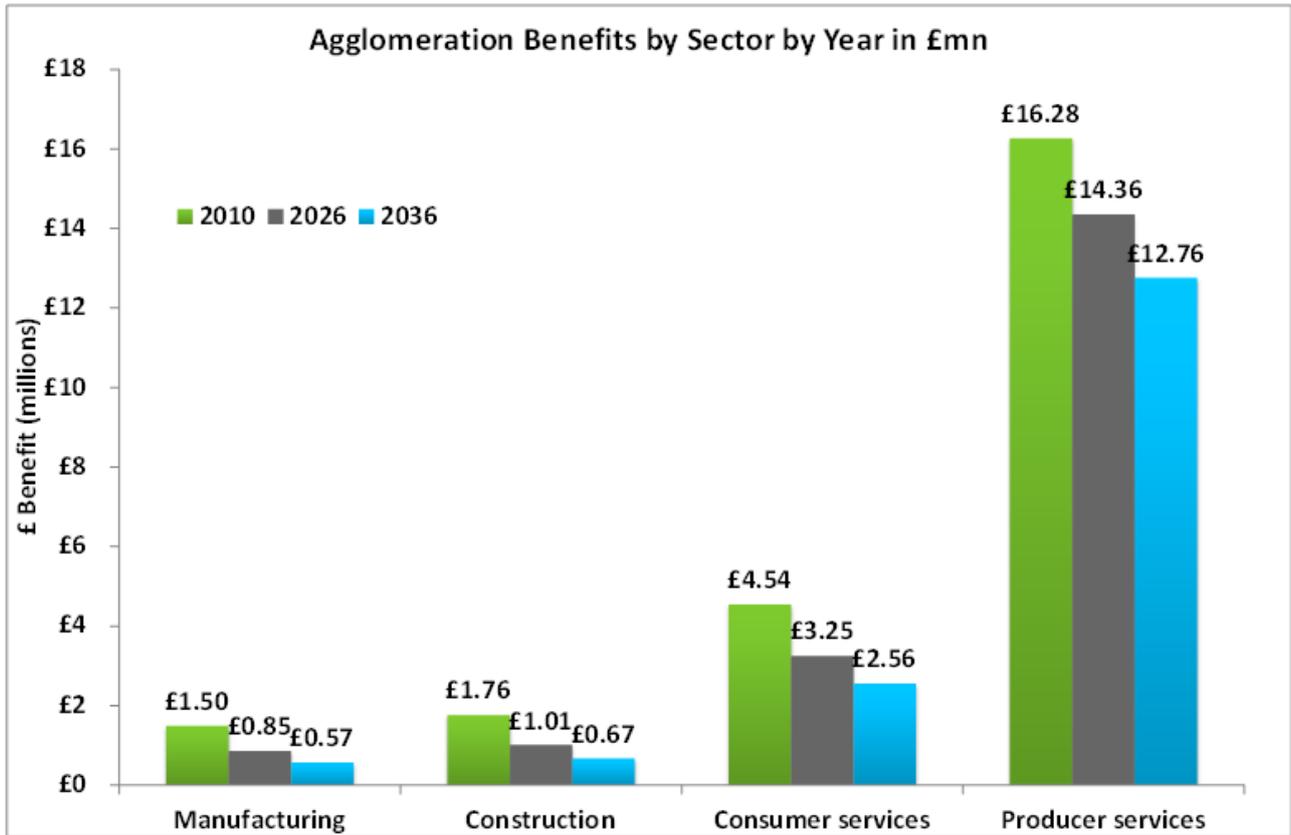
Agglomeration benefits are concentrated in the areas that enjoy the greatest increase in their connectivity with the rest of the region, in particular Kent West, Ashford and Shepway and London Central. The split of agglomeration between different parts of the study area is analysed in Figure 3.4 below:

Figure 3.4: Geographic Distribution of Agglomeration Benefits

Total Agglomeration Benefits in £mn
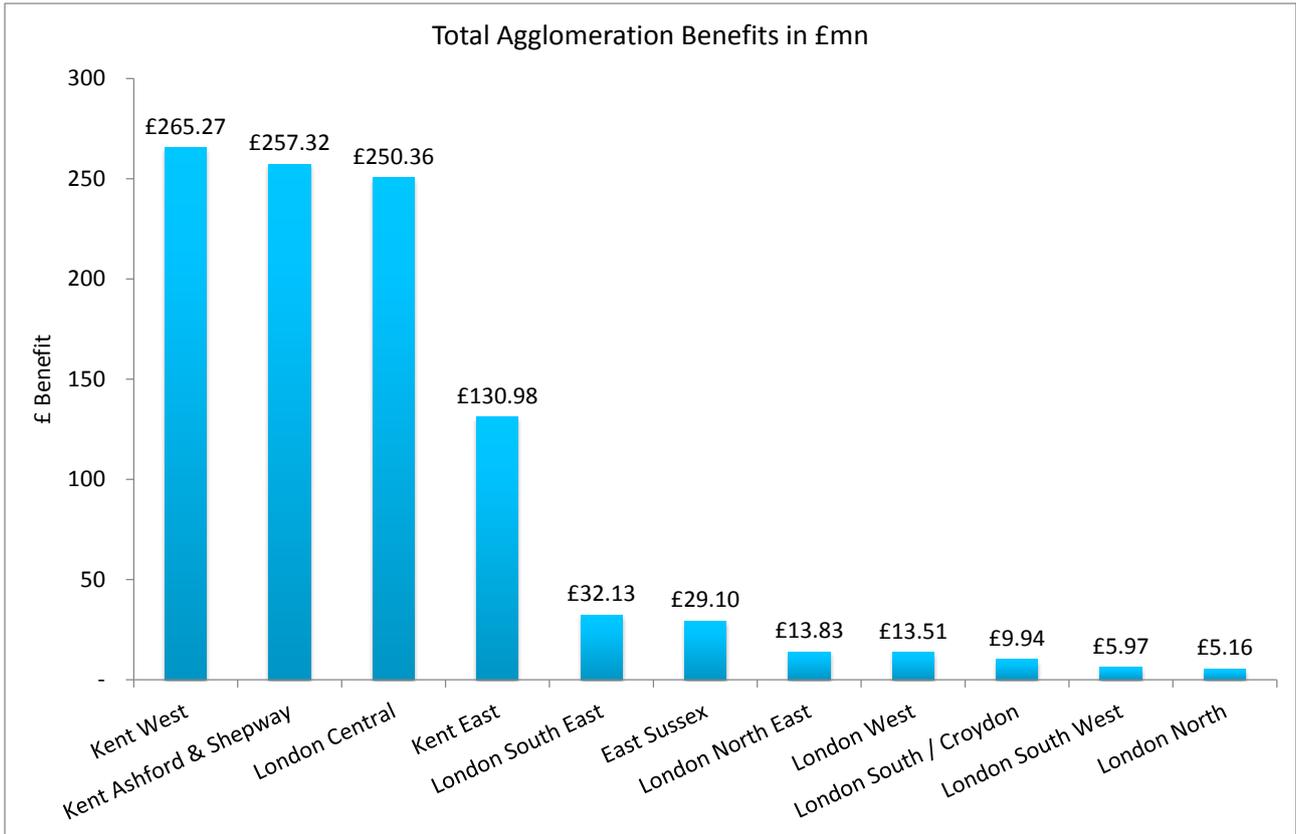
The labour market impacts of HS1 will also decrease over time and this has been explicitly modelled. The benefits were calculated for 2010, 2026 and 2036 as a basis for calculating the total present value of this benefit over the appraisal period. The results of these calculations are set out in Figure 3.5 below.

Figure 3.5: Change in Labour Supply Impact over Time
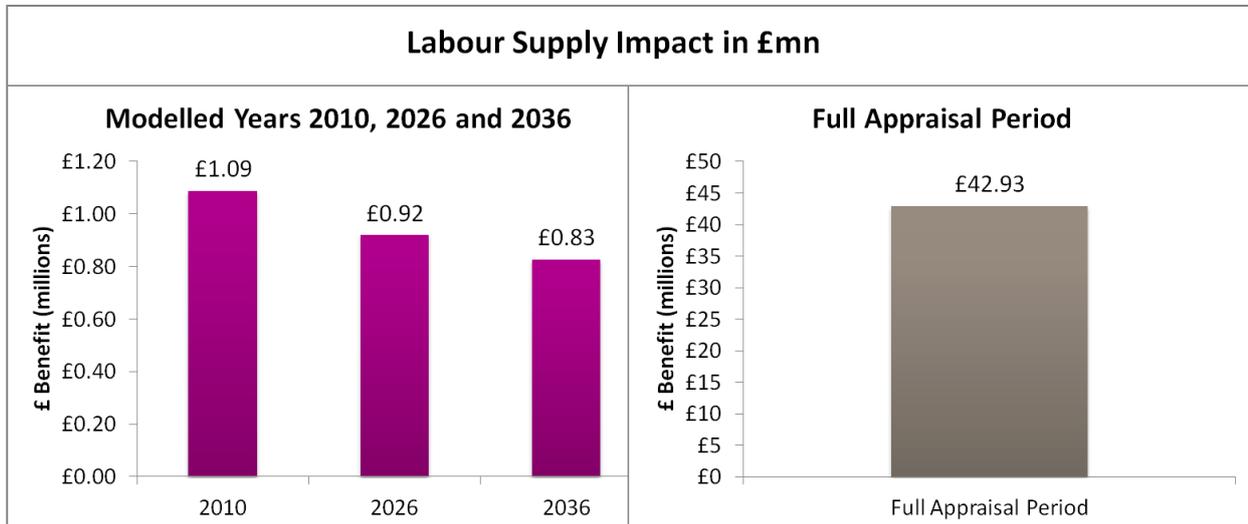
This benefit is concentrated in London, as the majority of additional workers entering the workforce due to the availability of HS1 will be commuters working in central London. The geographic distribution of the Labour Force benefit of HS1 is set out in Figure 3.6 below.

Figure 3.6: Geographic Distribution of Labour Force Benefits

Welfare Benefits from Labour Supply in £mn

4. Regeneration Impacts

4.1. Introduction

The evaluation of High Speed 1 has included consideration of the regeneration impacts to develop an understanding of the effect that the investment has had on local economic performance. As set out in the study brief, the regeneration workstream has been designed to enable a comparison of the timing and scope of benefits as well as identifying any location specific trends. The focus of the evaluation has been on identifying impacts following the commencement of HS1 domestic services in 2009.

The approach taken is consistent with DfT Green and Magenta Book methods and has been devised to help understand the extent that HS1 has been responsible for observed outcomes.

The following sections of this chapter explore the approach taken in undertaking the research before discussing the findings of each research method and the overall conclusions. The remainder of the chapter is made up of the following sections:

- An overview of the research **methodology**;
- **Revisiting the hypotheses** (first and second order);
- A summary of the findings of the **secondary data research**;
- The key findings of the **qualitative business surveys**;
- An overview of the findings from the key **stakeholder interviews**;
- **Understanding impacts against the logic model**; and
- **Summary and testing the hypothesis**.

4.2. Methodology

A triangulate approach has been taken for the regeneration workstream which has combined primary and secondary research of businesses and stakeholders for the defined study area alongside secondary analysis of data for control areas - this has been used to help identify the counterfactual position. The following section provides an overview of the research methods used for the regeneration analysis. Further detail on the approach taken was included in the Evaluation Scoping Report which is included in Appendix A.

Figure 4.1: Regeneration Impacts Methodology

4.2.1. Study area

The study area for regeneration impacts within the HS1 corridor is shown in Figure 4.2. Areas were selected that experienced changes in rail journey times at stations, including on the wider rail network. It follows district boundaries in order to aid the collation of secondary data at a consistent geographic level. In identifying the study area, consideration has also been given to the location of key regeneration areas within Districts.

Figure 4.2: Regeneration Study Area
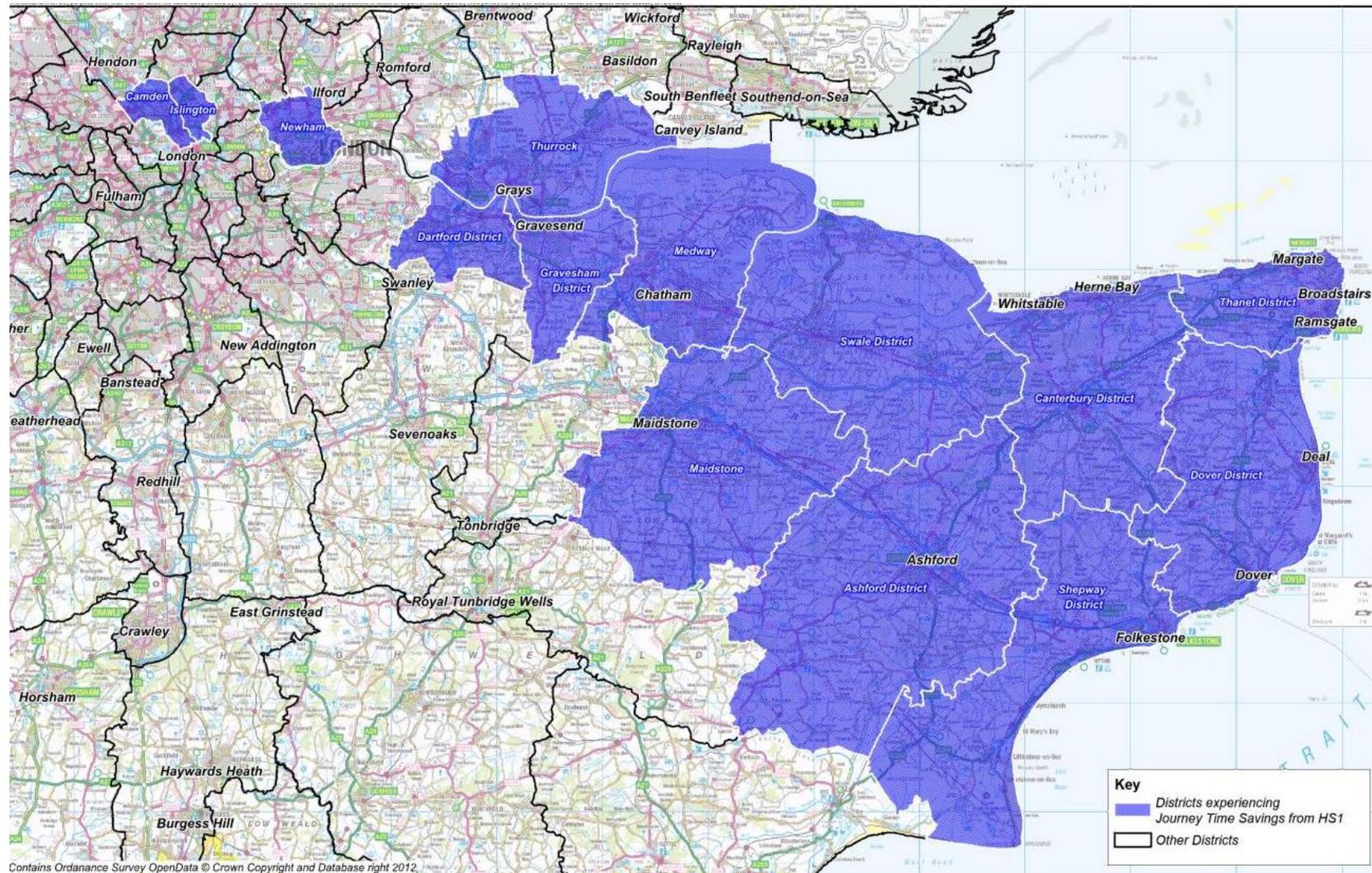
4.2.2. Secondary Research

Secondary data analysis has been collated for the study area to assist with profiling; it also provides quantitative data that has been used in conjunction with the primary research to identify and test connections between the intervention and the anticipated outcomes and impacts. Census data and other large scale nationally available secondary data sets were collated to ensure findings have been based on the most robust and statistically valid data available.

Data have been analysed at the overall corridor level and in 2km buffer zones around five core locations. The buffer zones have been agreed with the DfT and include areas around the four stations directly on the high speed route (King's Cross & St Pancras; Stratford; Ebbsfleet; and Ashford). From within North and East Kent, Ramsgate station was selected as the fifth buffer zone as it experienced the greatest reduction in journey time (by almost 50 minutes), following the 2009 revisions to the Southeastern timetable.

The presentation of data is limited by the available secondary evidence. Where possible the secondary evidence is presented for the period 2009 to 2013. However for some indicators, particularly those for local level statistics which tend to have longer publication lags, a narrower interval is presented.

The secondary data will provide intelligence on all businesses within the HS1 Corridor, not just those that are likely to benefit from HS1, and will identify broader changes in business and labour market performance. Given the time lags between businesses identifying potential investment decisions, the delivery of that investment and subsequent output being measurable in the secondary evidence (e.g. discernible increases in output or employment), the extent of impacts that can be identified in the secondary data over this time period will be limited.

Furthermore, the impact of the recession since 2008 will have: (i) added further delays to the business investment planning process as business wait for demand to return before undertaking costly or risky investments; and (ii) depressed prevailing economic output and employment levels, potentially masking any improvements that may be attributable to HS1.

The secondary research will identify areas where there are observable improvements that coincide with the commencement of the HS1 passenger service, both in absolute terms and relative to comparator areas. The triangulation approach will also consider the results from the secondary analysis alongside the results from the business survey and stakeholder interviews, which are better placed to identify changes in behaviour that may yield observable improvements in the future.

In order to provide comparator secondary data against which changes in the HS1 corridor would be reviewed, three control corridors have also been identified. The following corridors were agreed with the DfT and chosen as they each follow major radial rail routes from London and are broadly comparable to the HS1 Corridor in terms of their size, total population and employment base (as summarised in Table 4.1):

- Control Corridor 1: M11 corridor towards Cambridge;
- Control Corridor 2: M1 towards Milton Keynes; and
- Control Corridor 3: A12 towards Chelmsford and Colchester.

Table 4.1: Comparison of HS1 Corridor and Control Corridor Population and Employment Statistics

Area	Size (sq. KM)	Total Population*	Total Workplace Employment (2011)**
HS1 Corridor	3,213	2,269,000	1,095,000
Milton Keynes	3,202	2,508,000	980,000
Cambridge	3,119	2,606,000	1,051,000
Colchester	3,150	1,580,000	577,000

* Source: Annual Population Survey, Dec 2012
** BRES & ABI (ABI figures adjusted for consistency with BRES in line with ONS guidance)

The extent of the control corridors are displayed in Figure 4.3 (Cambridge and Milton Keynes) and Figure 4.4 London – Chelmsford). The corridors were chosen primarily because they represent alternative London

transport corridors. As no single corridor will exhibit the same broad characteristics as the HS1 Corridor, three corridors where chosen which cover a range of economic characteristics, including a knowledge based corridor to Cambridge to a more traditional economic corridor stretching into Essex via Chelmsford and Colchester. Given the strong transport links to London from these corridors, this approach provides a set of compactor areas which are likely to yield greater insight than an approach which only compares the HS1 Corridor results to England and the South East region.

Figure 4.3: Control Corridors Cambridge (1) and Milton Keynes (2)
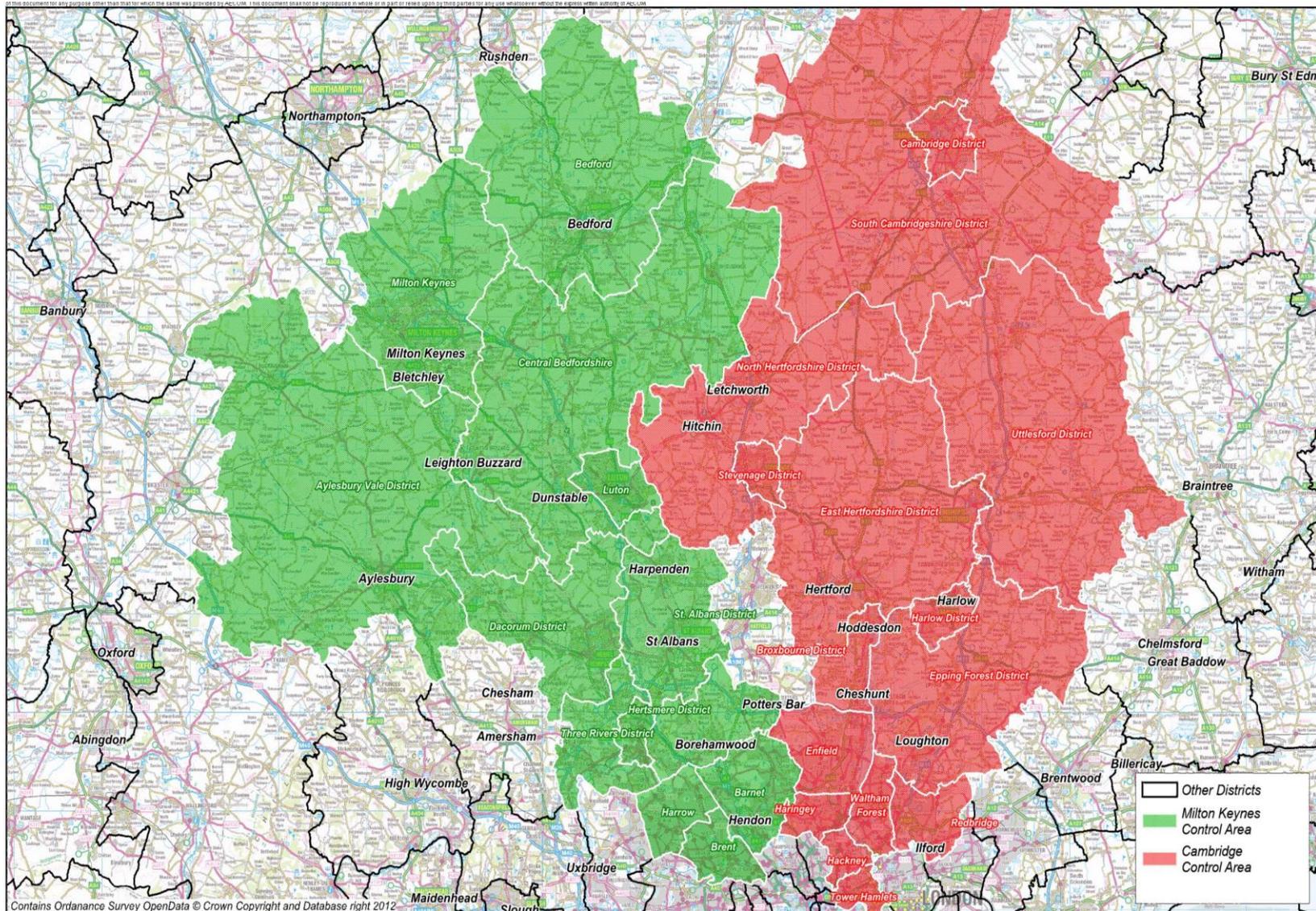
Figure 4.4: Control Corridor London – Chelmsford (3)

Contains Ordanance Survey OpenData © Crown Copyright and Database right 2012

Legend:
- Other Districts
- Chelmsford Control Area
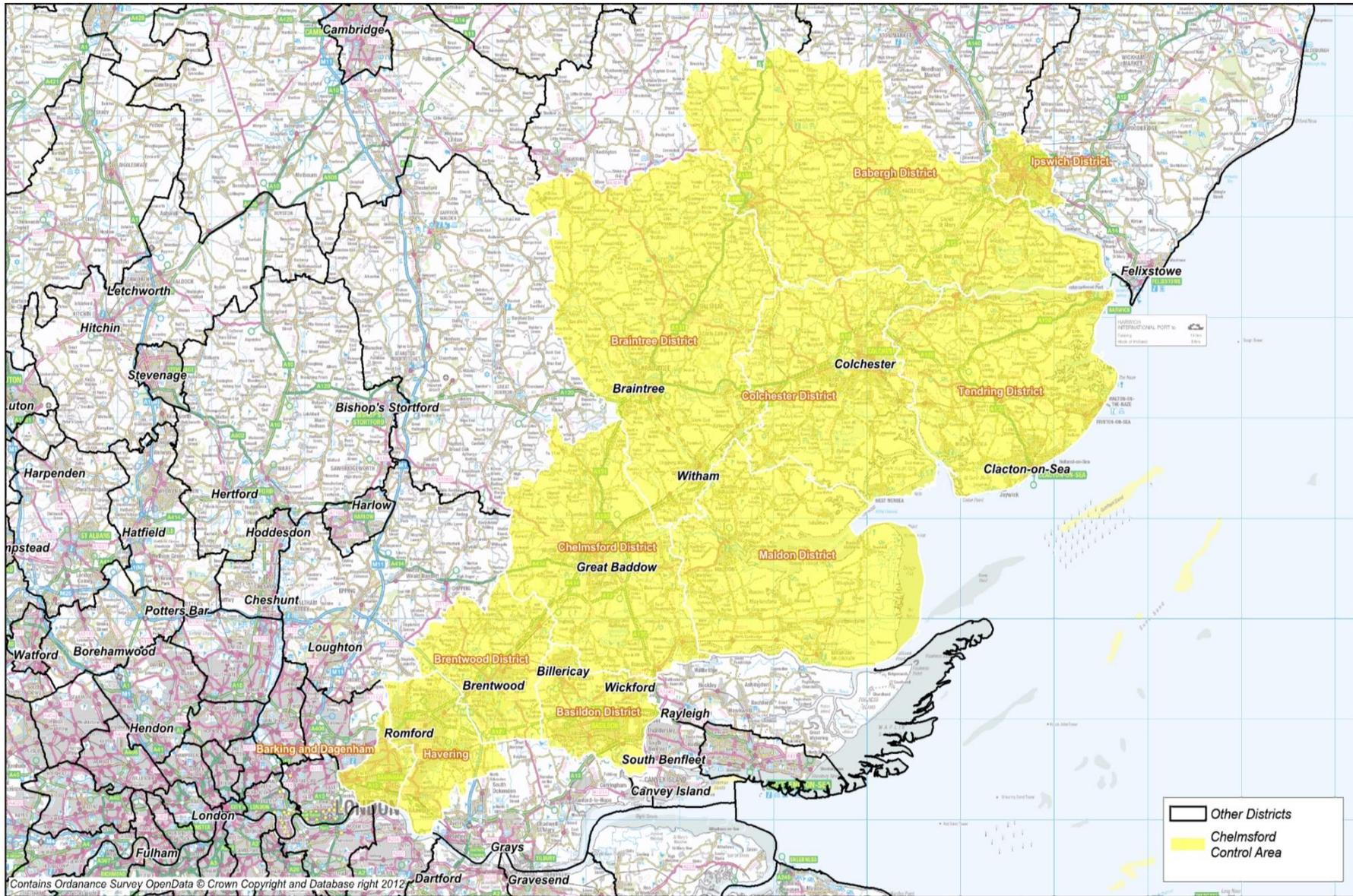
4.2.3. Primary Research – Qualitative Business Surveys

The primary research comprises of two elements: in depth interviews with a sample of businesses within the HS1 corridor and Key Stakeholder Interviews. Following discussions with the DfT, it was agreed that the methodology for the business surveys would be refined from a quantitative to a qualitative focused approach. The research has been developed to appreciate the full range of impacts resulting from HS1 and is particularly important in helping to understand the counterfactual position.

One advantage of surveying businesses directly is that it allows for the identification of business activities that may not yet be observable in the secondary data, whether due to reporting lags or the fact that the activity has not had sufficient time to yield an observable improvement in the data.

The qualitative business interviews, which also assist with the identification of Wider Economic Impacts as discussed in Chapter 3, help us to understand the nature, scale, location and timing of impacts. They are also central to identifying the extent that HS1 might be a factor in attributing observed changes.

4.2.4. Primary Research – Key Stakeholder Interviews

24 stakeholder interviews have taken place with representatives from the public and private sector. Stakeholders were selected that had been involved in regeneration activity throughout the High Speed 1 corridor and around the high speed stations (King's Cross-St Pancras; Stratford; Ebbsfleet; and Ashford). Regeneration practitioners, local authority officers, developers and commercial property agents were identified on the basis of their direct experience and knowledge of working in the area.

The stakeholder interviews are a critical part of the overall evaluation because they add value and depth to the quantitative analysis and aid the understanding of impacts against the hypotheses set out in the Scoping Report. For example, stakeholders may be aware of early stage investments or the views of businesses that are likely to influence future investment decision making that would not be picked up in the business surveys or secondary analysis.

4.3. Revisiting the Hypothesis

A series of logic maps have been developed to provide a framework for undertaking the evaluation. Bespoke logic maps have been developed for each of the key areas of change, including regeneration. The logic maps represent the 'theory of change' for HS1 and can be summarised through a causal chain as summarised in Figure 4.5.

Figure 4.5: Theory of Change for Regeneration Benefits
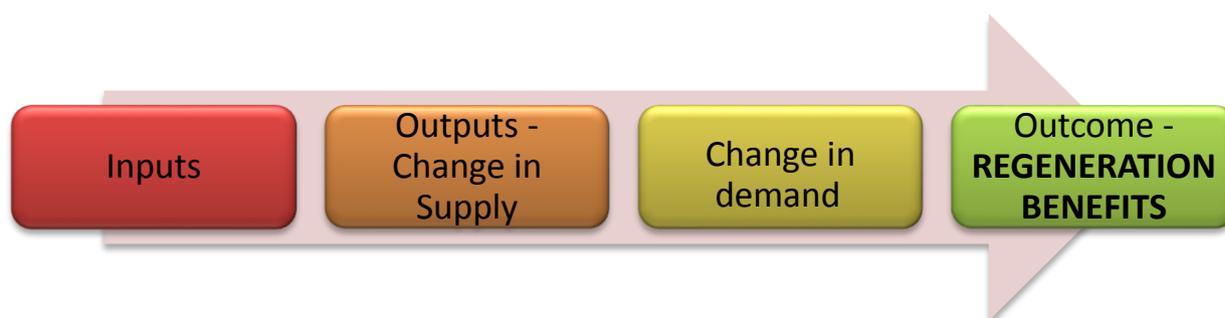
The logic maps informed the hypothesis for the evaluation and the framework against which the regeneration impacts have been reviewed.

The inputs represent the High Speed line and associated infrastructure (such as stations) that led to the introduction of High Speed services and the revised Southeastern timetable. The inputs also include the physical remediation associated with implementing the infrastructure and the relocation of the international terminus and domestic services to St Pancras.

The **outputs** associated with the regeneration impacts relate to the change in supply (i.e. journey time, frequency of service, reliability and crowding performance, and cost of travel), that result in an overall change (increase or decrease) in generalised cost for different groups of transport users.

This results in a **change in demand** whereby passenger numbers increase along the route and at key stations, which are close to some of the key regeneration sites. The generalised cost savings and change in transport outcomes have the potential to support **regeneration impacts** as identified by the scoping stage logic model (summarised in Figure 4.6). A further stage of the cycle is represented by the feedback mechanism, i.e. regeneration impacts have the potential to result in an increase in demand, which in turn feed through the logic map as second order regeneration impacts.

The development of the regeneration logic model was also used to identify central hypotheses that have been tested through the evaluation. The hypotheses were developed into first and second order hypotheses. As summarised in the following tables the methodology developed for the regeneration workstream was designed to directly respond to the first and second order research questions.

Table 4.2: First Order Regeneration Benefits

	Hypothesis	Data Sources/Approach
1.	**Employment**: Implementation of HS1 has created new (additional) employment and safeguarded existing employment in the corridor as a whole and around the key locations.	• Secondary data on changes in employment levels from the Business Register and Employment Survey and the Annual Business Inquiry (ABI). • Resident employment from the Annual Population Survey • Interviews with businesses including any identification of attribution. • Wider impacts and consideration of causal pathways has been informed by in-depth stakeholder interviews.
2.	**Economic Output:** Implementation of HS1 has brought about an increase in workplace GVA at the level of the overall corridor and at the level of key locations.	• GVA impacts examined using data relating to the employment impacts and GVA per worker values (by sector). GVA values per worker are reported by area and sector by the Office for National Statistics. Potential attribution relating to HS1 to be assessed through business and stakeholder interviews.

Table 4.3: Second Order Regeneration Benefits

|	Hypothesis	Data Sources/Approach
1.	**Real estate uplift:** Property values and rents at the key locations specified in the brief are higher as a result of the implementation of HS1.	• Rateable values and commercial rents data have been obtained from the Valuation Office. The analysis identified changes in values and compared against the control areas. • Average house price data have been collated using DCLG and land Registry data. • The qualitative interview programme has explored the extent to which any changes could be attributed to HS1.
2.	**Business performance:** Implementation of HS1 has improved business performance (employment and turnover) in the corridor as a whole and around the key locations.	• In-depth qualitative interviews have taken place with a range of businesses. The interviews included questions relating to business performance and the extent to which any change can be attributed to HS1.
3.	**Investment climate:** Implementation of HS1 has enhanced perceptions of the key locations specified in the brief.	• The assessment of the attractiveness of the area as a place to invest has been discussed through the stakeholder discussions which have included property market agents and developers.
4.	**Economic development:** Implementation of HS1 has contributed positively towards objectives for economic development and regeneration.	• This hypothesis has primarily been assessed through discussions with stakeholders working in economic development and property market agents.

Given the relatively short time period between the commencement of the first domestic rail passenger services (late 2009) and this evaluation (2013/14), the first and second order benefits are unlikely to have been fully realised. This issue is likely to have been compounded by the adverse economic circumstances that have characterised the evaluation period. For example, the period from 2009 has nationally included (i) a reduction in residential and commercial investment in response to the financial crisis and (ii) a large reduction in public sector capital investment as a result of the ongoing period of fiscal consolidation.

The use of Logic Models allows for the identification of interim outputs that suggest whether these benefits are likely to be realised at a future date.

Figure 4.6: Regeneration Impacts Logic Model (outcomes)

for full logic model refer to Evaluation Scoping Report (Appendix A)

Increased footfall and retail spend around stations

Worker and agglomeration benefits
– Reduced travel times for existing staff has positive impact on staff retention
– Reduced travel time encourages more workers to travel to core locations. Expands labour market.
– Existing and potential businesses able to interact more effectively with each other and have a greater choice of inputs (suppliers, labour) and potential markets (Agglomeration benefits).

Investment climate
Introduction of HS1 enhances perceptions of regeneration areas and the wider corridor amongst potential investors / developers.

Extended work horizons
Extends work horizons for residents living within core regeneration locations and the wider corridor. This in turn increases employment opportunities (including type and salary).

Feedback Loop
Generates additional trip demand purely from change in supply / generalised cost

Real Estate Uplift
Property values and rents increase within regeneration areas and the wider corridor.

Business performance and job creation (Existing businesses)
– Increases competitiveness of existing employment sites.
– Increases productivity of existing businesses. Increased turnover and company profits.
– Companies enter higher value operations.
– Existing businesses increase staff numbers.

Business performance and job creation (New businesses)
– Creates new and well-connected development opportunities.
– Encourages inward investment bringing new jobs.

Business performance
– Improved business performance (employment and turnover).
– New (additional) employment created and existing employment safe guarded (higher employment density).
– Improvement in skill base.

– SOME OFFSET BY RELOCATION OF JOBS (AND WORKERS) FROM KENT TO LONDON (WHERE PRODUCTIVITY LEVELS ARE HIGHER) - SEE WIDER ECONOMIC BENEFITS

– Higher levels of employment within regeneration areas and the wider corridor, in better paid (higher value) jobs.
– Improvement in welfare and well-being (employment rates, earning, levels of deprivation, etc.)

– Increase in commuter and business travel

Wider Context
– Olympic effect
– Thames Gateway Growth Area
– Local planning policy
– Change in tax regime
– Wider changes in structure and buoyancy of the economy.

Increase in Gross Value Added
– Value of goods and services produced in regeneration locations and wider corridor increases.

4.4.   Secondary Data Research and Analysis

4.4.1.   Introduction

The following section outlines the findings of the secondary data analysis that has been collated for the study area. The data are integral to understanding the scope of regeneration impacts and profiling of the study area. The methodology outlined below has been used to assess the extent that HS1 has led to regenerative improvements for the impact area, rather than for specific groups.

4.4.2.   Methodology

The methodology used in the secondary data research and analysis follows that set out in the Assumptions and Economic Data Report (July 2013), included in Appendix C, and draws upon the available secondary evidence covering two spatial levels:

- The HS1 Corridor; and

- The 2km buffer zones around five stations: King's Cross & St Pancras; Stratford; Ebbsfleet; Ashford; and Ramsgate.

The regeneration related impacts that have been assessed are:

- Business rates and the number of commercial premises based upon Valuation Office Agency (VOA) data;

- DCLG data on average house prices and total housing stock;

- Workplace employment (BRES & ABI data) and associated GVA based upon GVA per employee; and

- Resident employment from the Annual Population Survey and wages from the Annual Survey of Hours and Earnings (Office for National Statistics).

The following section outlines the key findings of the secondary data research. The full assessment of secondary data can be found in Appendix F: Secondary Data Analysis Report.

4.4.3.   Control areas

The results for the station buffer zones and HS1 Corridor have been compared to results for the three Control Corridors, as outlined Section 4.2. The Control Corridors together provide a baseline case against which the observed changes in economic and regeneration performance can be measured. The corridors are not intended to be directly comparable to the HS1 Corridor, but to provide three comparator areas whose economies are closely connected to London and which exhibit a range of economic characteristics against which the performance of the HS1 Corridor can be compared. From these data it is possible to identify those areas where buffer zones and / or the HS1 Corridors are under or over performing relative to the Control Corridors.

4.4.4.   Business Rates and Commercial Property

The analysis of rateable values (used as a proxy for real estate values) identified evidence that rateable values in the HS1 Corridor as a whole have increased at a faster rate than the Control Corridors. At the station buffer zone level, rates have generally increased in line with the District average. Analysis of the number of commercial premises shows significantly faster rates of growth at all the station buffer areas compared with the corresponding District average.

Business rate data have been obtained from the VOA to identify change in average rateable values of businesses in small areas. Between 2005 and 2010, the average rateable value of a business property

located in the HS1 Corridor increased by 24% from £31,000 to £38,300 - a greater increase than the average increase across England and for each Control Corridor. A comparison of the change in average rateable values for the study area, control areas and for England can be seen in Figure 4.7. Given that the most recent data are available for 2010, this is unlikely to represent the impacts of any business investment decisions that have occurred as a direct result of the commencement of the HS1 service, but may reflect investment decisions that occurred in anticipation of the HS1 service. Further analysis of the next available data (in 2017) will provide further insights on the impacts of HS1 on business rates and commercial property values.

Figure 4.7: Comparison of Average Rateable Value of Business Properties
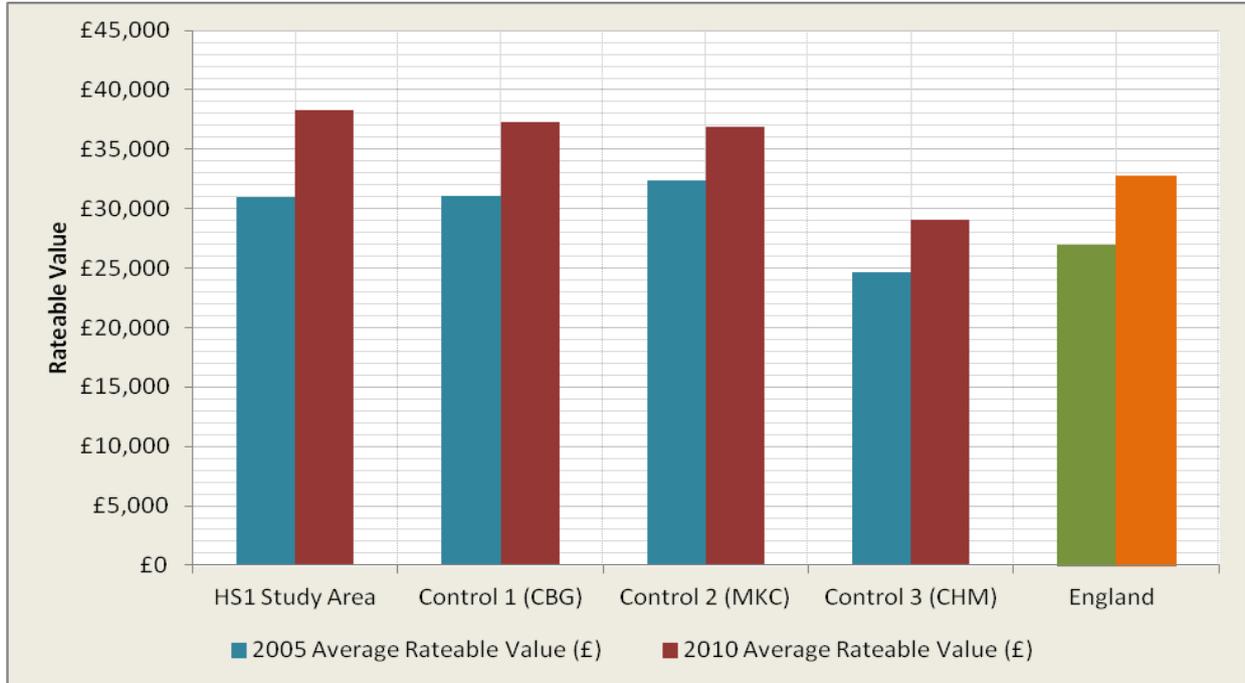
Source: Valuation Office Agency, 2013

A review of average business rates at the 2km buffer zone level was more variable as identified in Table 4.4. Impacts were also considered within 500m buffer zones around the stations to determine whether there are any highly localised impacts on the number and value of commercial premises close to the HS1 stations.

At this smaller geographic level, businesses rates increased faster within 500m of the stations at St Pancras and Ramsgate than for the wider district. However, the change in average rateable values within 500 metres of Ashford station, whilst positive, was less than half that of Ashford District. The largest increases at both the 500m and 2km buffers were around King's Cross-St Pancras although the influence of London-wide factors makes attribution of impacts difficult to ascertain.

Table 4.4: Percentage Increase in Average Rateable Values (2005-10)

	500m buffer zone	2km buffer zone	District
Ashford International	8.7%	16.0%	17.2% (Ashford)
St Pancras (London)	53.1%	46.0%	47.3% (Camden)
Ebbsfleet	*	28.7%	11.3% (Dartford)
Ramsgate	25.9%	21.1%	20.7% (Thanet)
Stratford International	*	25.7%	28.2% (Newham)

Source: Valuation Office Agency (2013); *Insufficient businesses based in this location in 2005.

Figure 4.8: Change in Number of Commercial Premises (2005-10)
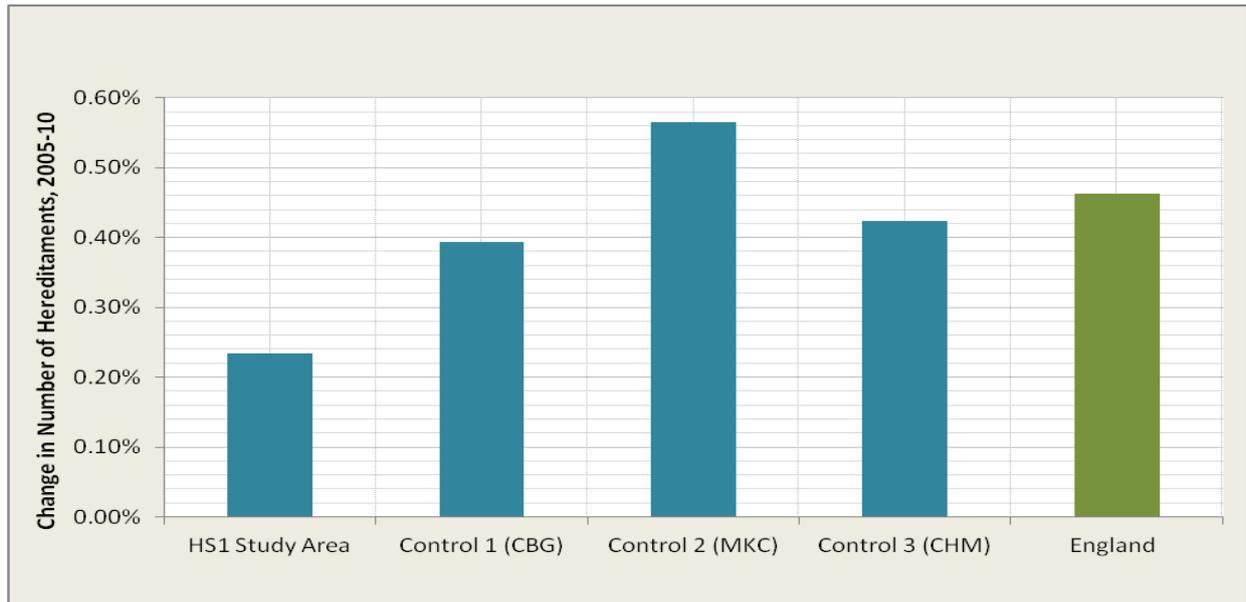
Source: Valuation Office Agency (2013)

For commercial premises the VOA identified 77,070 commercial premises in 2010 at the corridor level, which was up marginally from 76,890 in 2005. This represents growth of 0.23% over five years. As identified in Figure 4.8, this is below the rate of growth that occurred nationally and within the three Control Corridors. However, Table 4.5 demonstrates there is evidence that the number of business premises has increased faster in the areas surrounding the HS1 stations than at the district or HS1 Corridor level.

The most significant growth occurred around Ashford station, where the number of businesses increased by 4.8% within 500m of the station and by 6.1% within 2km, compared to an increase of 0.77% across Ashford district. Weaker growth occurred within the Stratford International 2km buffer zone; this compares to zero growth for Newham Borough over this period, however it may reflect some displacement of borough businesses to the new Westfield shopping centre at Stratford.

Table 4.5: Percentage Increase in Number of Commercial Premises (2005-10)

	500m buffer zone	2km buffer zone	District
Ashford International	4.8%	6.1%	0.8% (Ashford)
St Pancras (London)	5.1%	2.9%	0.1% (Camden)
Ebbsfleet	*	4.7%	0.7% (Dartford)
Ramsgate	2.0%	3.5%	0.7% (Thanet)
Stratford International	*	0.6%	0.0% (Newham)

Source: Valuation Office Agency (2013); *Insufficient businesses based in this location in 2005

4.4.5. House Prices and Housing Stock

With the exception of St Pancras, there is no evidence that the commencement of HS1 services has coincided with significant uplift in house prices within the corridor or station buffer areas when compared to data for the control corridors. The rate of increase for each of the three station buffer areas in Kent was less than the average rate of increase for England and Wales.

The secondary data analysis reviewed data published by DCLG on housing prices and housing stock at the local authority and station buffer area level. Changes in house prices in the corridor are summarised in Table 4.6. Taking the period 2005-2012, there has been robust levels of growth however, since 2010 the level of growth has failed to keep pace with Control Corridors 2 and 3.

Table 4.6: Percentage Change in Average House Prices

	% Change 2005Q3-2012Q3	% Change 2010Q1-2012Q3
HS1 Corridor	36.5%	4.2%
Control Corridor 1: M11 towards Cambridge	33.0%	11.7%
Control Corridor 2: M1 towards Milton Keynes	49.2%	12.1%
Control Corridor 3: A12 Chelmsford / Colchester	15.3%	2.2%

Source: DCLG

Table 4.7 identifies changes in the numbers of homes in the corridors. As a proportion of total housing, the net increase in permanent dwellings within the HS1 corridor was marginally above the level of housing growth in Control Corridor 3 and marginally below the level of housing growth in Control Corridors 1 and 2. This suggests that, at the corridor level, difference in house price changes are unlikely to be explained by differences in the level of housing completions. However, housing supply effects are likely to be relevant to some of the smaller housing market areas within each corridor.

Table 4.7: Growth of the Housing Stock Average

	2009	2010	2011	2012	Change 2009-12	
					Absolute Change	% Change
HS1 Corridor	944,400	952,500	959,960	967,420	23,020	2.4%
Control Corridor 1: M11 towards Cambridge	1,034,830	1,046,220	1,054,700	1,064,700	29,870	2.9%
Control Corridor 2: M1 towards Milton Keynes	982,160	990,100	998,250	1,008,280	26,120	2.7%
Control Corridor 3: A12 Chelmsford / Colchester	670,370	673,850	677,310	680,930	10,560	1.6%

Source: DCLG

Additional data on all dwelling purchases within England (published by the Land Registry) has also been used to identify changes in average house prices for the five station buffer zones (as demonstrated in Table 4.8). It is not directly comparable with corridor level data as it is taken from a different source. At the buffer zone level the highest house price growth occurred within the two London buffer zones (King's Cross - St Pancras and Stratford International).

The three station buffer zones in Kent all underperformed the HS1 Corridor average over the period 2010-13 – average house prices grew at less than half the HS1 Corridor rate in the Ashford buffer zone and in Ebbsfleet house prices remained unchanged over the period 2010-13. The rate of increase for the Kent station buffer zones was also less than the average for England and Wales. However, it is important to recognise that the housing market varies significantly, even within small geographic areas, and housing located within the station buffer zones may not be attractive, for example, to people looking to commute to London. Such housing is likely to be located in areas with good connectivity to the station hub, which may be located outside of the buffer zones identified around the station locations. Furthermore, difficult housing market conditions outside of London since 2008 may have delayed investment in higher quality residential units around the station sites. This is considered in the stakeholder interviews.

Table 4.8: Average House Prices, by 2km Buffer Zones (£)

	2009	2010	2011	2012	2013*	% Change 2010-13
HS1 Study Area	247,000	286,000	285,000	281,000	286,000	16%
St Pancras	555,000	641,000	726,000	732,000	832,000	50%
Stratford International	204,000	223,000	221,000	247,000	246,000	21%
Ramsgate	155,000	163,000	156,000	162,000	169,000	9%
Ashford International	144,000	157,000	159,000	161,000	154,000	7%
Ebbsfleet	162,000	164,000	162,000	161,000	162,000	0%
England & Wales	210,000	233,000	234,000	235,000	237,000	17%

Source: Land Registry; *Based on Jan-June 2013 only (Nominal prices, not adjusted for inflation)

4.4.6. Workplace Employment and Associated GVA

Between 2009 and 2011, employment growth in the HS1 corridor was ahead or in line with two of the three control corridors but significantly behind the Cambridge corridor. Where employment growth has occurred in the HS1 corridor it has typically been in the lower value sectors.

4.4.6.1. Employment impacts at the corridor level

Total workplace employment provides a direct measure of the extent to which net job creation has occurred in the HS1 corridor and five station buffer zones since 2009. As identified in Table 4.9 total employment in the HS1 Corridor remains below its 2008 peak, reflecting the national recession, however since 2009 total employment has slowly recovered. In comparison to the control areas, growth since 2009 is in line with employment growth in Control Corridor 2 and is stronger than the performance of Control Corridor 3. In contrast, Control Corridor 1 has achieved a faster rate of recovery, with total employment, increasing by 3.6% since 2009.

Table 4.9: Total Workplace Employment

	2007	2008	2009	2010	2011	% Change	
						2007-11	**2009-11**
HS1 Corridor	1,121,000	1,132,000	1,087,000	1,093,000	1,095,000	-2.3%	0.7%
Control Corridor 1: M11 towards Cambridge	1,037,000	1,048,000	1,015,000	1,020,000	1,051,000	1.4%	3.6%
Control Corridor 2: M1 towards Milton Keynes	1,002,000	1,026,000	974,000	979,000	980,000	-2.2%	0.6%
Control Corridor 3: A12 Chelmsford / Colchester	585,000	598,000	582,000	577,000	577,000	-1.4%	-0.8%

Source: BRES & ABI (ABI figures adjusted for consistency with BRES in line with ONS guidance)

Within the HS1 Corridor, the strongest growing sectors between 2009 and 2011 were Accommodation & Food Services (13%) and Business Administration (12%). Strong employment growth was also observed in the Wholesale sector. Whilst significant it should be noted that the aforementioned sectors are all 'lower value', in terms of the national measure of GVA per employee. Employment growth within higher value sectors has been less strong and total employment has declined or remained constant in five of the eight sectors identified as having an above average level of GVA per employee.

A full breakdown of employment change by sector is included in the Regeneration Impacts Assessment of Secondary Data (Appendix F). Out of the growing higher value sectors the HS1 corridor demonstrated the following shifts:

- Employment growth in the Information and Communications sector within the HS1 Corridor is above the rate of growth in Control Corridor 2, but less than half the growth rate of Control Corridors 1 and 3;

- Employment in Financial Services has increased modestly since 2009 (+4%) compared to a significant reduction in Control Corridors 2 and 3. However, the rate of growth is lower than that experienced in Control Corridor 1; and

- The HS1 Corridor has also experienced growth of the Mining, Quarrying, and Utilities sector however this is a less significant sector in employment terms, accounting for 1% of the total employment base.

4.4.6.2. Employment impacts at the station buffer zone level

Overall, there is evidence that employment growth at some station buffer areas has been stronger between 2009 and 2011. Variability in performance suggests that observed areas of employment growth in the buffer zones could be building on existing local strengths. Equally, as core regeneration sites, impacts in the buffer areas may not have fully emerged as a result of the recession and lags between investment decision making and activity.

At the station buffer zone level, the trend for total workplace employment since 2009 is less positive. Although total employment in the HS1 corridor increased between 2009 and 2011, it has declined around St Pancras, Ebbsfleet and Ashford International Stations and remains unchanged around Ramsgate.

Sector analysis for the buffer zones identified that employment has predominantly declined in higher value sectors. The main exception is Stratford International, where employment growth has generally been positive across all sectors, perhaps explained by the fundamental changes in the local economic structure that have occurred through regeneration activity in the area. The other areas of higher value employment growth include the growth of employment in Professional, Scientific & Technical Services in Ashford and the growth of employment in Information & Communications and Manufacturing in Ramsgate.

4.4.6.3. Changes in GVA

In the HS1 Corridor estimated GVA has increased at a higher rate than the Milton Keynes and Colchester Corridors (2009-11) but the increase is considerably lower than the Cambridge corridor. Much of the improvement in GVA in the HS1 corridor is associated with growth in higher value sectors.

A high level estimate of change in GVA levels across the four growth corridors has been made to help understand whether HS1 has helped to enhance economic output. Due to lags in the publication of local level GVA data, it has not been possible to directly measure change across the corridors. Instead, a GVA calculation has been developed based upon GVA per employee data, broken down by sector for local areas, and then aggregated across the growth corridors.

A summary of the findings for each corridor is included in Table 4.10 although it should be noted that, as the estimate is based on sector employment it excludes any general productivity and 'within sector' productivity improvements. It is also an estimate based on the allocation of employment change at the local authority level to a broader local (NUTS3) geography and consequently should only be considered a guide as to the likely GVA impacts associated with the changing employment profile between 2009 and 2011.

Table 4.10: Estimated GVA Change Associated with Changing Employment Profile

	Estimated Change in GVA (2009-11) 2010 prices (£m)
HS1 Corridor	187
Control Corridor 1: M11 towards Cambridge	3,108
Control Corridor 2: M1 towards Milton Keynes	-259
Control Corridor 3: A12 Chelmsford / Colchester	-630

Source: BRES[44]

As can be seen, based upon the changing employment profile for each corridor, there has been an estimated increase in GVA in the order of £190m. Whilst this is considerably smaller than the estimated increases associated with employment change in Control Corridor 1 it is greater than for Control Corridors 2 and 3 where it is estimated that GVA will be lower in 2011 as a consequence of employment moving from higher to lower value sectors.

In understanding the basis of these trends it is important to acknowledge the influence of changing employment patterns as described in Appendix F. Much of the estimated improvement in GVA for the HS1 corridor is associated with sectors where GVA per employee is higher in the HS1 corridor than the national average including Information and Communications, Real Estate Activities, and Business Services Activities. The focus of this growth has also been located in central London and does not necessarily reflect consistent performance across the corridor.

4.4.7.   Resident employment and wages

Analysis of resident employment has identified a mixed pattern within the HS1 corridor. Whilst some areas have experienced positive changes a number of local authority areas saw declining levels of employment. Overall, since 2009 growth in the HS1 corridor has been lower than the control corridors. In relation to wages there is no evidence that the corridor is over or under-performing.

In addition to the impact on workplace employment, analysis of changes in the resident employment base has been completed. Resident employment, taken from the annual population survey, includes HS1 corridor residents that work outside the corridor in addition to those who live and work there.

In 2013, there were 1.02 million people employed in the HS1 Corridor, around 200,000 fewer than Control Corridors 1 and 2 and 250,000 more than the resident employment in Control Corridor 3. Within the HS1 Corridor the number of residents that were in employment had increased by 2% since 2009 which was considerably lower than the rate of resident employment growth in Control Corridor 1 (+7%) and half the rate of growth that occurred in Control Corridor 2 (+4%). However growth in the corridor was marginally higher than the rate of growth of resident employment in Control Corridor 3 over this period (+1%).

Within the HS1 corridor, the strongest residential employment growth occurred in Swale (+13%) and Shepway (7%). In general the London boroughs (Newham and Camden) performed better than local authorities in Kent with both experiencing increases of 6%. Despite the high levels of growth in these strongly performing areas it should be noted that the best performing local authorities in the control areas outperformed those in the HS1 corridor. For example resident employment in Cambridge increased by 19% and resident employment in Watford increased by 22% over the same period.

Within the HS1 corridor employment decreased in some local authority areas with Thanet experiencing the greatest decline with a reduction in employment of -15% between 2009 and 2013. Other decreases in the corridor included Gravesham (-8%), Canterbury (-7%), Dartford (-1%) and Dover (-1%).

Analysis has also considered changes in resident's wages which helps to understand whether there have been changes to the quality of jobs taken by residents. Table 4.11 presents the average weekly wages (since 2002) of full time employee residents of the HS1 Corridor and Control Corridors. There is no evidence that the HS1 Corridor is under or over performing against the Control Corridors since 2009.

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[44] GVA per employee data is available for ten employment sectors down to NUTs level 3 geographies.

Table 4.11: Average Weekly Wages of Full-Time Employees (£)

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	% Change 2002-12	% Change 2009-12
HS1 Corridor	522	535	548	562	581	610	630	641	653	667	657	26%	3%
Control 1 (Cambridge)	540	581	587	609	626	643	672	689	703	703	715	32%	4%
Control 2 (Milton Keynes)	550	568	582	593	607	636	653	666	678	678	675	23%	2%
Control 3 (Chelmsford)	500	530	528	555	553	577	599	608	627	637	647	29%	7%

Source: Annual Survey of Hours and Earnings (Residents Analysis - nominal wages, not adjusted for inflation).

4.4.8.   Summary

The secondary data analysis identified variable impacts within the HS1 corridor and also buffer areas. Whilst overall the results for Business Rates / Average Rateable Values are broadly positive, suggesting an increase in demand for employment space, many of the other results from the secondary evidence are less positive. Within individual data sets there are positive results specific to particular growth locations (e.g. St Pancras and Stratford), these variable results do not provide consistently strong evidence to suggest that changes have been markedly different in the HS1 corridor relative to control areas. Performance of the station buffer areas in Kent has been particularly poor.

Overall the evidence gathered does not present clear evidence of early positive impacts however, the influence of external factors that provide the context for the observed results should be taken into consideration. Specifically, the limited time between the introduction of the HS1 passenger service and the collection of this data is unlikely to have been sufficient to reflect the impact of business location decisions made post 2009, although some impacts of decisions made in anticipation of HS1 could have been picked up. Business investment decisions can take a number of months or years from inception to delivery and the impacts for the business in terms of higher levels of turnover or employment follow at a later stage – these timescales will be longer the more significant the scale of investment or the associated risks (such as the choice to relocate). Consequently, businesses are unlikely to react immediately to new opportunities arising from HS1 - a factor compounded by the impact of the recession as businesses may put off costly or risky investments until they are confident that demand for their products has returned.

The use of control areas has provided a useful benchmark for measuring impact although it should be noted that the different economic profiles of the control areas may have been a factor in explaining the variation in observed results. For example, the Cambridge corridor may have been more resilient to recent economic events than the HS1 Corridor, due to the higher value nature of their economies and this may explain its stronger performance since 2009.

4.5.   Primary research – Qualitative Business Surveys

4.5.1.   Introduction

As part of the primary data collection exercise in depth interviews were carried out with businesses in the station buffer areas. The purpose was to assess the extent to which businesses reported any observed impacts of HS1 relating to:

- Location;
- Recruitment and retention of staff; and
- Business performance.

The following section outlines the key findings of the Qualitative Business Surveys. The full Business Interview Report can be found in Appendix D.

4.5.2. Methodology

4.5.2.1. Recruitment

A list of businesses based within a 2km radius around the station buffer areas (4km radius for medium and large companies) was purchased from the Experian National Business Database from which a sample of businesses was recruited. In order to secure a representative sample of businesses, quotas were set for size and sector – the sampling approach was agreed with the DfT prior to the surveys being undertaken.

4.5.2.2. In-depth Interviews

In-depth interviews were held with each businesses with interviews structured through the use of a topic guide which covered the following subject areas (the full topic guide is included in Appendix D):

- Background company information;
- Location factors;
- Access for staff/ modes used to commute;
- Business travel;
- Client and supplier visits;
- Company turnover; and
- Specific questions relating to HS1.

As a baseline survey was not completed prior to the commencement of HS1 services, it was necessary to retrospectively assess the relative importance of HS1 in relation to other factors that affect surveyed businesses. In order to avoid survey bias, respondents were not asked directly about HS1 until the end of the interview. However, if respondents did mention HS1 and its impact on their business they were then probed for further details.

A timeline was used to assist respondents in thinking through changes that had occurred in the company over the last 8 years (or since inception for newer companies). Any changes in staff or financial turnover were then identified and the reasons for these discussed to establish if there was any correlation with the introduction of HS1.

4.5.2.3. Sample

The 70 interviews were divided equally between the five locations. Table 4.12 below shows the size of companies at that site who were included in the research.

Table 4.12: Size of Company at Site by Location

	King's Cross	Ramsgate	Ebbsfleet	Stratford	Ashford	Total
Micro (1-9)	3	6	1	0	2	12
Small (10-49)	1	2	5	3	4	15
Medium (50-199)	6	4	5	8	7	30
Large (200+)	4	2	2	3	2	13
Total	**14**	**14**	**13**	**14**	**15**	**70**

Interviews were secured with companies covering a wide variety of industry sectors including: law firms; large supermarket chains; distribution companies; retail; and leisure providers.

4.5.3. Survey Findings

4.5.3.1. Location factors

The importance of transport links was clearly identified when discussing location factors with transportation links the most frequently mentioned strength and weakness of a location. Over half of respondents referred to access by road as one of the main reasons for their business location whilst just under half of all

respondents cited good public transport links as a key benefit of their location – this was particularly true of companies based in locations around King's Cross and Stratford.

The main locational weakness mentioned by businesses was congestion. Roads that were considered particularly problematic for the businesses interviewed included: the M20; A13; A12; M25; M11; and Dartford Tunnel. Poor public transport was mentioned primarily in locations that were more remote.

> Although 'transportation links' was the most frequently referenced strength or weakness of a location, unprompted HS1 was only referenced by one company as a location benefit.

4.5.3.2. Access for staff/ modes used to commute

Location had the largest impact on the mode of transport used for travelling to work. Businesses based in King's Cross and Stratford stated that their staff used all modes to commute to and from work but public transport, and in particular the underground and train, were the modes of transport used most. Businesses based in Ramsgate, Ebbsfleet, and Ashford reported that the majority of staff travelled by car. The main reasons for travelling by car were convenience and as a result of working shifts or antisocial hours which meant that public transport was not perceived to be a viable option.

4.5.3.3. Staff numbers, recruitment and retention

About a third of business reported a decrease in staff numbers over recent years, almost all of which were related to the recession and the economic climate generally. Equally about a third of companies reported a general increase in staff numbers. These increases in staff numbers were owing to company growth, company mergers and companies expanding into new areas.

> Unprompted none of the businesses interviewed mentioned HS1 or any transportation related issues/events as a reason for any change in staff numbers although one company, based in King's Cross, suggested HS1 has helped widen the catchment from which they recruit.

Owing to the recession many companies reported having less of a problem with recruitment and retention than they have historically but it was noted that as the economy is now changing some companies were now finding that people were starting to move around again.

Around a quarter of companies interviewed felt that transportation and access to site did impact on their ability to recruit and retain staff. Particularly in the case of lower paid jobs, respondents reported that people were unwilling to travel long distances and could not afford to. Congestion was also thought to have a negative effect on those companies who have particular skill requirements.

One company based in King's Cross stated that they could now easily recruit people from some distance from London as long as that person lived on a main transport corridor. Conversely one company in Ashford thought it would help them attract people away from the London firms.

> "Certainly in my department, being able to recruit financial people from London and so forth it should open up more doors." (1273, Ashford)

The main issues affecting recruitment and retention were personal development and salary; these factors were cited as the main reason people left was for better prospects. About a quarter of companies felt transportation affected their ability to recruit and retain staff, particularly in lower paid jobs.

Although many respondents saw HS1 benefitting those people who commute to London, no one mentioned that this would take staff away from them as people seek new opportunities further afield. Rather, more people were moving out of London and therefore bringing more money into the area.

Many companies interviewed had been established before the introduction of HS1 and so perhaps did not see the benefits in terms of current staff travel as staff that were in place before the introduction of the revised timetable already had their travel in place.

4.5.3.4. Business travel

Businesses interviewed identified a broad range of travel patterns for business related travel. There were some companies which did not travel for business purposes or where business trips were primarily local,

whilst others travelled nationally and internationally. The majority of respondents did not think that the number of business trips had changed dramatically over recent years.

Car was the mode of choice for most companies for business travel with at least half of all companies saying the main mode used was car. The main reasons identified were convenience and not having to get from stations/ stops to their final destination. Mode choice depended on the location of the meetings; when meetings were in London respondents generally used public transport. Train was the next most frequently used mode of transport for business trips with two fifths stating they used the train for some of their business trips. Those that did liked the fact they could work on the train and therefore there was less time wasted on travelling.

Several companies mentioned HS1 (unprompted) and how they used it for business trips. Some stated they were now using the train more for business trips (and less car) and some stated how it had improved their efficiency (due to less time lost in travelling).

"Great, I think it's (HS1) great, yes, 37 minutes, I can go to London, do two meetings and still be back in the office in the afternoon."

4.5.3.5. Client and supplier visits

The mode choice for customers reflected the mode used by businesses for their outward travel. The most frequently mentioned mode was car but it depended on where they were based. Trips within London tended to be by public transport but outside car was considered more convenient. Suppliers tended to travel by road as they generally had goods to deliver.

Unprompted a few companies mentioned HS1 and how it helped them attract business/customers nationally and internationally.

4.5.3.6. Company turnover

Most companies interviewed reported some change in turnover although businesses did not generally consider transportation to be a key influence on business performance. Most increase in turnover was thought to be as a result of company growth and/or coming out of recession and most decreases in turnover were because of the recession and general loss of business. One company did state that HS1 had had a direct (but unquantifiable) impact on their growth.

"Has it [HS1] affected our economic growth since we moved here, I think we've secured more instructions from being here and because of our proximity to Essex and the wider geographic market, yes, I think it has made a difference. Can I quantify that in pounds, shillings and pence, no, probably not. In terms of our income, as an office, last year we've probably gone from about 1.5 million in 2010 to 2.5 million, 2.75 million last year."

Although businesses did not generally state HS1 had affected their turnover, some were using it to make cost savings through time saved travelling and the ability to work whilst travelling. Therefore, indirectly HS1 had improved some businesses financial performance.

4.5.3.7. HS1

In order to gauge the relative importance of transportation, and in the absence of a baseline business survey, HS1 respondents were not prompted initially to think about HS1 when talking about location, recruitment and retention, and business performance. At the end of the interview respondents were specifically asked about the impact HS1 had had:

- On the company;
- Locally; and
- The South East.

On the company

When asked directly, just over a third of companies interviewed thought HS1 has had a positive impact on their business. Those based in Ashford in particular reported seeing a benefit from the introduction of HS1.

Respondents were asked what impact they thought HS1 had had on their company. Just over half of the seventy businesses interviewed did not think the introduction of HS1 had affected their company at all and five thought HS1 had had a negative impact.

The key ways in which HS1 had positively affected the businesses interviewed included:

- **Improved business travel:** a fifth of companies interviewed stated the introduction of HS1 had improved their business travel within the South East. Some businesses, located around King's Cross, also referred to the benefits of the international connections;

- **Improved access for customers or suppliers:** a similar proportion of businesses also stated that HS1 had made it easier for clients to visit;

- **Improved access for staff and recruitment and retention:** businesses in King's Cross, Ashford and Ebbsfleet in particular reported that HS1 had improved the daily commute for their staff. HS1 was also considered to have made some businesses more accessible and or attractive locations to work;

- **Increased investment in area:** just less than 10% of companies felt a positive impact of HS1 was the wider investment it had brought to the area. The majority of these companies were based in Ashford, where the station is more established, as it was built for the original Eurostar service. It may be too soon to observe impacts of businesses near the other HS1 stations which have received an improvement in their connectivity relatively recently;

- **Increased Business:** a few companies felt HS1 had or would result in an increased amount of business. However, they could not put a figure on the value of the work; and

- **Influenced Decision to Stay:** four businesses stated that HS1 was an influencing factor in their location decision to remain at their site, one of which stated it was an influencing factor in their decision to move to that site.

Locally

When asked directly, two thirds of respondents believed HS1 has had a positive impact locally. Respondents living in Ashford and Ramsgate in particular perceived there to have been positive benefits.

The main benefits of HS1 for the local area included improvements to:

- **Land and property values:** just over a quarter of companies based across all areas thought HS1 and associated development has had a positive impact on land and property price;

- **Local economy:** again just over a quarter of companies thought HS1 had improved the local economy, mainly through attracting more people to either live in the area or in terms of increasing footfall; and

- **Perception of area:** Ashford, Stratford and King's Cross in particular were thought to have benefited from a more positive general perception of the area.

The South East

> Just under two thirds of companies interviewed thought HS1 had had a positive impact on the South East even if it had not directly benefitted their company. Those companies based in Ashford, Ramsgate and King's Cross in particular felt HS1 would have a positive impact for the South East.

The main reason respondents felt HS1 had benefitted the South East was because it allowed people to **move out of London and commute to London**. Almost a third of respondents felt that this was the most significant benefit of HS1:

Other benefits included:

- **Improved links to continental Europe:** a few companies mentioned the benefit of HS1 for business trips to Europe but a couple of companies also mentioned that Eurostar has opened up the ability for people to commute across countries; and

- **Modern transport link which gives positive image in general:** around 10% of respondents felt that a modern transport link gave a good impression generally.

4.5.4.   Summary

The feedback from the interviews highlighted very few businesses referred to HS1 as having a direct impact on businesses when not prompted. Businesses did not generally identify that HS1 had significantly impacted upon staff recruitment and retention (except for a few businesses in niche or high value sectors) and only four of the seventy companies interviewed stated that HS1 was an influencing factor when deciding where to base their company – however we would not expect a significant proportion of businesses to have considered relocating in the period 2010 to 2014. Unprompted, HS1 was not identified as a factor in affecting staff numbers – the recession was thought to be a greater influence on staff numbers.

HS1 was not generally thought to have had a direct impact on company turnover. Only 1 business identified (unprompted) that HS1 has had a positive impact on the growth of their business, but was not able to quantify the impact.

However, one key benefit of HS1 that was identified by businesses related to time savings for business travel. The time savings were seen to be significant owing to the resulting productivity benefits. When prompted, a fifth of businesses reported that HS1 had impacted positively on their business travel. Once prompted, four of the seventy companies interviewed stated that HS1 was an influencing factor when deciding where to base their company; one business of the four identified that it affected their decision to move to their current site.

> *"Absolutely, if High Speed 1 wasn't here we probably wouldn't have come here in the first place".* (790 Ebbsfleet)

When prompted, HS1 was also seen by a large proportion of businesses as having positive impacts on the local area. Two thirds of respondents felt that it had improved the local area through positive impacts on land and property values and the local economy. The overall impact on perceptions of the area was also thought to have been enhanced as a result of HS1, including increasing the attractiveness of the corridor as a place to live.

4.6.   Primary research – Key Stakeholder Interviews

4.6.1.   Introduction

As part of the evaluation, stakeholder interviews were held with regeneration practitioners, local authority officers, developers and commercial property agents. The stakeholder interviews are a critical part of the overall evaluation because they add value and depth to the quantitative analysis. Specifically the qualitative interviews covered the following aspects of the evaluation:

- An understanding of the critical path to impact – the sequence of events and timing of impacts on the ground, including causalities and dependencies;

- Help in the assessment of attribution of the secondary data and to isolate any developments or changes in conditions in the corridor that might be a consequence of HS1;

- Provide a commentary on the impact on an area where no quantitative impact has yet been picked up in the data;

- Provide a view on the prospects and developer sentiment in an area and help us to attribute this non-quantifiable yet important factor to HS1;

- Help us understand what would have happened in the absence of HS1 – i.e. the counterfactual; and

- They identify unexpected or wider impacts outside the initial hypotheses.

4.6.2. Methodology

4.6.2.1. Stakeholder selection

Stakeholders were selected that had been involved in regeneration activity throughout the High Speed Rail corridor in Kent and London and around the new high speed stations (King's Cross-St Pancras; Stratford; Ebbsfleet; and Ashford). Regeneration practitioners, local authority officers, developers and commercial property agents were identified on the basis of their direct experience and knowledge of working in the area. The aim was to explore and test the regeneration impact hypotheses outlined in Section 4.3 above. A total of 24 stakeholders were selected and interviewed, as set out in Table 4.13 below:

Table 4.13: Stakeholder List (Regeneration)

Kent Stakeholders Public and Private	Property Stakeholders and London
Kent Invicta Chamber of Commerce	London and Continental Railways
Locate in Kent (Inward Investment Agency)	London Borough of Camden,
Kent County Council	London Borough Newham
Thurrock Council	London Legacy Development Corporation
Dartford Borough Council	Property Agent A
Gravesham Borough Council	Deloitte Real Estate
Medway Council	Argent LLP (Developers King's Cross)
Swale Borough Council	
Maidstone Borough Council	
Ashford Borough Council	
Canterbury City Council	
Thanet District Council	
Dover District Council	
Shepway District Council	
Atrium Surveyors	
Paramount Park	
Martine Waghorn (Developers)	

4.6.2.2. Interview structure

The stakeholder interviews were structured around a Topic Guide which is appended to the Stakeholder Interviews Report (attached to this report as Appendix E). Stakeholders were asked to identify the extent that HS1 and domestic services using the infrastructure had played a role in shaping strategic and investment focused decision making, as well as impacts on businesses and people living in the study area. The discussions sought to identify and test the regeneration impacts before during and following opening as well as reviewing against a counterfactual position taking into account the changes in impact resulting from the phased opening of the route[45] and the commencement of domestic high speed services in 2009. The following topic areas have been considered:

- Impact on travel and activity around stations;

[45] Section 1 opened in 2003 between the Channel Tunnel and north Kent terminating at Waterloo. Section 2 opened in 2007 between a newly built Ebbsfleet station in Kent and London St Pancras.

- Worker and agglomeration benefits;

- Extended work horizons;

- Impact on land use planning;

- Investment climate;

- Business performance and job creation; and

- Strategic Added Value (including strategy and policy).

4.6.3. Analysis of the Stakeholder Interviews

The following section provides a summary of the key findings from the Stakeholder Interviews. The findings have been considered both at the corridor level and for the following spatial areas where distinct social and economic conditions have played a significant role in shaping regeneration impacts:

- King's Cross-St Pancras;

- Stratford; and

- Kent (particularly focused around the HS1 stations).

More detailed analysis of the findings of the stakeholder interviews, broken down by the topic areas can be found in the Stakeholder Interview Report (Appendix E).

4.6.3.1. King's Cross-St Pancras

The International Station opened in 2007 providing high speed services from the continent to the north of London, re-routing services from the previous terminus at Waterloo. The station also serves domestic services which from 2009 included the termination of high speed services from Kent. As well as being centrally located the terminus is well connected to the wider rail network and the London underground network. The area around the station has been subject to large scale regeneration plans both prior and post the opening of HS1; the stakeholder discussions specifically sought to identify the role that HS1 has played in supporting this transformation. The following conclusions can be drawn from the structured interviews.

HS1 has had a major catalytic effect

> Fundamentally it was believed that the regeneration activities and inward investment that had taken place in London since the construction of HS1 would not have happened on the scale and at the same pace without HS1.

When discussing the context around the opening of HS1 stakeholders referred to the long term blight that had afflicted the area around King's Cross and St Pancras stations. Despite previous attempts to rejuvenate this historic part of London, significant development in the area had stalled for over 40 years. Consultees in both the public and private sector considered HS1 to have been the major catalyst that had created the necessary conditions to stimulate regeneration activities in this area through the following:

- Land and infrastructure required for HS1 catalysed land assembly;

- HS1 provided the impetus for redevelopment of St Pancras station specifically; and

- HS1 unlocked other transport improvements (including King's Cross redevelopment).

Adjacent to the station, property developers Argent are in the process of developing an area known as the Regents Quarter. This major development represents a further £2bn of investment in the King's Cross area and it was highlighted that this was predicated on £2bn in transport improvements (including those related to HS1).

Catalytic role of HS1 has supported investment and attracted new businesses

Stakeholders considered that the arrival of HS1 to King's Cross had raised the aspiration of regeneration goals and has helped enhance the competitiveness of the area.

> The infrastructure and land unlocked by HS1 has helped create one of the strongest locations in Europe for businesses, retail and residential development.

Whilst emphasising the emerging strength of the area for retail and leisure stakeholders also identified that King's Cross has demonstrated its attractiveness as a location for ICT, digital, life science and creative sectors with large organisations including Google being attracted to the area. In addition, reference was made to emerging clustering of world class academic institutions and institutes such as the Crick Institute and the Wellcome Foundation as part of the Creative Quarter initiative. Stakeholders suggested that the level of development and types of high value businesses that were being attracted to the area would not have been possible without HS1.

In addition to the physical infrastructure and the attraction of new businesses, stakeholders also referred to other local benefits for businesses and residents:

- Improved performance of public-facing businesses as a result of increased traffic;
- Creation of construction jobs; and
- Permanent employment opportunities in new businesses that are now accessible to local residents.

One factor that stakeholders suggested had supported investment and growth around King's Cross was high levels of connectivity to the surrounding area. Ensuring the station has remained permeable has enhanced pedestrian flows and circulation, thus making the area more attractive for businesses

Provision of high speed rail itself is not the most significant factor

Despite acknowledging the role that HS1 had played in stimulating investment and growth in the King's Cross area, property market stakeholders stressed that the provision of high speed rail services itself and the resulting transport accessibility benefits is not a defining factor for most investors and businesses. Faster journey times and connectivity to Europe were thought to be less important economically to the area and to the London economy than the role of HS1 in triggering billions of pounds of development in a key strategic, yet underutilised and underdeveloped, part of London (as a result of the opening up of land for development).

> Argent's enquiries about factors that have influenced decision making when moving to the King's Cross area highlighted that thus far only 5% of commercial and residential occupiers so far have referenced HS1 had a factor in their location decision.

In relation to worker and agglomeration benefits around King's Cross and St Pancras, stakeholders stressed that attributing the effects of HS1 amongst a myriad of wider influencing factors is difficult. Central London experiences significant dynamism and a critical mass of opportunity and agglomeration that act as 'pulls' on stimulating investment and growth. This can be seen in the extent of investment from a wide range of sources that has been seen in the King's Cross area.

Stakeholders acknowledged that access to a wider labour market through HS1 would be a positive factor. However, the overall labour market available to businesses in central London was such that the net benefits would be relatively small. Similarly, for workers moving to residential properties near the station the advantages of HS1 were not thought to be a significant factor in their location decisions - of all the residential sales at Argent's development at King's Cross only 5% mentioned HS1 as in any way being part of their decision.

The overarching feedback given by stakeholders was that although HS1 was *necessary* as a lever to stimulate on regeneration activity, a high speed link was *not in itself sufficient* to produce the level of activity and growth that had been experienced in the area.

Wider influencing factors

Stakeholders identified a number of other key factors that had influenced the scale and pace of regeneration at King's Cross. Stakeholders did not define a level of attribution or rank the different causal links however, the following conditions were thought to have played a significant role in influencing investment in the area:

- **Existing transport links and connectivity** – the existence of two mainline rail stations and good connections to London Underground and the wider public transport network in London means that enhanced access is proportionate to existing connectivity. As well as the investment at St Pancras, the £2bn of transport improvements has seen a redeveloped King's Cross, investment in London Underground (Victoria Line), and new and redeveloped Thameslink stations.

- **Availability of brownfield land** – the ability of partners to assemble a large area of brownfield land in a central location connected to two mainline stations was thought to be key to the site's success. London and Continental Railways (LCR) ownership of the site was also identified as instrumental.

- **Good forward planning and positive partnership** – the importance of strong partnership and co-ordination of key parties including LCR, Camden Council and also the developers was crucial to maintain momentum and deliver success.

- **Pedestrian permeability** – The redevelopment of St Pancras ensured that barriers to movement through the station were reduced so that the station became connector rather than a barrier to movement.

Difficulty securing some types of local benefits

Despite the scale of investment in the area, Camden Council suggested that the impact has been spatially limited. Benefits have been concentrated in the area around the station and it has not driven regeneration or footfall in nearby Somerstown. In addition, where local businesses are not public facing they were seen to have generated fewer benefits in the local area.

Although the development had been successful in attracting new retail occupiers to the station area, in particular within the station buildings, the accessibility of the types of high end occupiers was not thought to benefit many local residents to the same extent.

4.6.3.2. Stratford

Stratford, in east London, is an area that has also seen large scale regeneration activity alongside the investment in HS1. Stratford International Station became operational for Southeastern rail services from November 2009 although it is not served by international services. The station sits at the heart of Stratford City which is considered to be the largest single mixed-use urban regeneration project in Europe. The station is also adjacent to the site that held the Olympic Games in 2012. When asked about the regeneration impacts of the station stakeholders referred to the following impacts:

Catalytic effects

As for the area around King's Cross the construction of HS1 required significant upheaval in the area around the new station. HS1 was thought to be a factor in bringing forward the large retail-led Westfield development whilst it was also seen to have contributed to a successful Olympic Bid. London and Continental Railway referred to HS1 as having an enabling role in facilitating the Olympic bid as the associated work resulted in the removal of freight railway lines that were on the site of the future Olympic park. Reference was also made to the accessibility benefits of the Javelin services which provided additional transport capacity to serve the Olympic Site using HS1 infrastructure – the **London Legacy Development Corporation** suggested that the previous capacity was insufficient to meet demand.

Overall, although stakeholders suggested HS1 had a catalytic role in bringing forward development it was not considered to be as direct as that experienced around King's Cross-St Pancras.

Influence of wider factors

Despite the role that HS1 had played in supporting the scale of regeneration that has occurred in the area, stakeholders emphasised that it was difficult to disaggregate from other factors. The Olympic site clearly benefitted from work associated with HS1 and the improved transport links but stakeholders stressed that Stratford was inherently attractive as an Olympic Games location in its own right.

Public and private sector stakeholders also referred to the wider transport links in place or proposed that demonstrate, even without HS1, Stratford benefits from high levels of accessibility. Stratford Station benefits from an interchange of London Underground, mainline rail services, DLR and bus services. The construction of Crossrail was identified as further evidence of investment that is influencing regeneration in Stratford.

Extent of regeneration impact

Stakeholders suggested HS1 had been more significant as a tool for bringing land forward for development than stimulating regeneration in the wider area

Reference was made to the clustering of activity around the mainline station and Westfield as oppose to Stratford International. In terms of retail performance whilst the improved connectivity provided by the high speed Southeastern services was considered to have opened up catchments in Kent, LB Newham referred to the wider Essex catchment as being more significant.

Stakeholders did not refer to HS1 having a large benefit on access to labour markets despite the improved links to Kent and central London unprompted. When asked about labour market accessibility HS1 was not seen to be a significant factor.

Marketing is one area where direct links to HS1 can be seen. Marketing material for Westfield refers to access by HS1 whilst emerging residential developments in the legacy Olympic site, for example Chobham Manor, are using HS1 as a feature of their marketing. Overall it was considered too early to say whether these activities were having a beneficial impact.

Connectivity benefits

On reflection, stakeholders believed that the extent of impact on regeneration has to be considered against the level of accessibility improvements afforded by the new service. According to stakeholders HS1 does not significantly improve integration with Central London as existing transport links already offer rapid connectivity to Central London. The main Stratford Station was identified as offering better interchange opportunities and is more extensively used and according to LB Newham, it was the opening of the Jubilee Line that was particularly significant for the area as it sent the 'signal' that Stratford was connected to Canary Wharf and central London.

4.6.3.3. Kent

Stakeholder interviews covering Kent were held with local authorities in the corridor area where significant journey time savings were likely. In addition, engagement also took place with commercial agents with direct involvement in the major regeneration and development schemes in the county. The discussions sought to identify common ground within the corridor whilst also recognising the variety of contextual factors that shape the county.

HS1 has played a major role in land use planning decisions

HS1 has played a key role in influencing strategic planning and decision making. In terms of large scale regeneration activity and masterplanning within the corridor, this has principally taken place for land adjacent to the new high speed stations.

Stakeholders representing Dartford and Ashford explained that land adjacent to Ebbsfleet and Ashford International stations remains central to growth aspirations for both areas. The influence on Ebbsfleet can clearly be seen as prior to proposals for HS1 the land was designated as greenbelt – the change in planning status for the station and surrounding development proposals were conditional on HS1. Dartford Borough Council, Gravesham Borough Council and Kent County have worked together to ensure that opportunities for new economic development and activity are maximised around the station. Policy frameworks have been established to safeguard the area for suitable developments through setting of key criteria which development proposals are required to meet. HS1 also remains central to supporting strategic development in adjacent areas such as Eastern Quarry, near Ebbsfleet, where up to 6,500 new homes are planned.

Ensuring connectivity between the HS1 station and new development sites was identified as being central to the success of regeneration in Dartford. Ebbsfleet station is to become established as a transport hub which should be connected to development sites through investment in transport links such as the Fastrack busway.

As part of the Channel Tunnel Rail Link significant land assembly took place in Ashford and this was also seen to have helped facilitate some earlier development in the town prior to the opening of HS1. However, significant areas of land remain undeveloped adjacent to the station and on land between Ashford International and the town centre plans are currently emerging for a new commercial quarter with HS1 a key selling point.

Local authority stakeholders also suggested that in areas served by HS1 and the new stations, infrastructure has been used to support the case for growth. Reference was made to Dartford and Ashford as being central to growth plans in the county with the largest forecast increases in housing stock over the next decade planned for the two local authorities. Local stakeholders representing Dartford and Ashford referred to the importance of integration with HS1 when planning growth.

Wider examples of HS1 supporting strategic decisions were referenced in locations not directly on the high speed route, but connected to it. Although smaller in scale, HS1 has been used to support local plans with examples including the use of HS1 to provide the "final seal of approval" for attracting several Universities' branch campuses to Medway. Areas adjacent to stations, including in Canterbury and Gravesham, have also been identified as focal points for commercial development with access to London acknowledged as being a key asset in attracting investment.

Demand has not yet matched aspirations

Despite land allocations and planning policies that have sought to exploit links to HS1, stakeholders acknowledged that take-up at core opportunity sites had been restricted to date. Development around Ashford station has been limited and Atrium Surveyors identified that HS1 has not yet had an impact in actually bringing forward new commercial sites. Adjacent to Ebbsfleet station, allocated sites remain largely undeveloped with development limited to 200 residential units to date. This delay between available land opportunities and investment is reflective of a period of inertia in development decisions and also the fact that there is often a three year lag between the decision to invest and impacts on the ground, as noted in the secondary analysis.

Whilst accessibility was seen to be an important attractor for developers and occupiers the benefits of HS1 services were not necessarily greater than for other modes of transport. Where development had taken place in Kent stakeholders acknowledged that it had been more focused on sites where direct access to the motorway was available. In Ashford and Dartford respectively, sites at Eureka Park and The Bridge Development had attracted significant investment and businesses despite being located at sites that are not adjacent to HS1 stops. In Dartford recent development has focused on the existing urban area of Dartford rather than the strategic sites adjacent to the HS1 station.

Where development had taken place in the corridor stakeholders more frequently identified residential led growth than commercial development. Stakeholders also referred to some long term sites beginning to be taken forward such as Chilmington Green in Ashford.

Some impact on location decisions and job creation

The discussions with stakeholders did not identify any broad trends or large scale shifts in location decisions or job creation. However, localised evidence of impact had been experienced in some locations and was referenced in the interviews. Overall, where HS1 was considered to have played a role in location decisions it was generally thought to be a contributory factor but not the most significant consideration. In relation to job creation and business performance, although some stakeholders suggested that HS1 has had a positive impact, limited direct evidence was referenced.

Access to London was central to location decisions referenced by stakeholders, with international links thought to be less relevant. Evidence of businesses re-locating from London to Kent was cited by a number of stakeholders with some relocating completely and some maintaining a 'customer facing' office – the reduced journey times to central London were seen to be critical in enabling businesses to make these decisions. Some evidence of clustering activity in locations benefitting from HS1 was also referenced. The Life Sciences sector has demonstrated greater interest in locating in Kent at Discovery Park (Sandwich) as a result of enhanced connectivity to London.

The influence of the recession was a common theme identified by stakeholders and this has played a role in slowing momentum for change. Whilst it was acknowledged that the recession has delayed investment decisions some impacts may now be emerging. Perhaps the most significant development along the HS1 corridor relates to the Paramount Park proposals. Investors are seeking to develop a new theme park and have selected a location near to Ebbsfleet Station as their preferred site. No other locations were considered to have the necessary levels of accessibility to London and internationally.

> *"Longer term benefits to the UK are enormous – 27,000 jobs and an estimated $1billion in exported products and services. We would not be implementing the scheme without HS1".*
>
> Representative for Paramount Park

Impact on residential property prices

As previously discussed, a number of stakeholders were of the opinion that HS1 had greater influence on the residential market than commercial development thus far. HS1 was thought to have supported an increase in trips to London which was having an effect on making residential areas along the corridor more viable commuter areas. As well as improved perceptions of the area, stakeholders referred to plans for residential housing growth (in particular in Ashford and Dartford) in locations served by HS1 - house price increases were seen to be linked to improved access to employment opportunities (primarily in London). Examples cited by stakeholders were that house prices in Ashford were outstripping those elsewhere in Kent whilst house prices in areas that are accessible from Ebbsfleet station have increased relative to other areas. It should be noted that these findings are not corroborated by analysis of 2km buffer zones around stations. However this may be because the areas of above average house price growth do not closely match the 2km buffer zones around the station locations.

In locations that had seen significant journey time savings, accessibility to London was seen to be driving changing perceptions about Kent as a place to live. This can lead to increased interest in moving to areas that are now considered to be viable commuter locations.

> *"HS1 supports access to higher value job opportunities in the financial and business services, historically not areas where the commuting population of Kent were as well represented as locations to the south and west of London. Employment opportunities are now more accessible as a result of the new routing and over the long term this has the potential to change the skills profile of the county".*
>
> Kent County Council

Neutral and adverse impacts

Although stakeholders were generally able to identify positive impacts from HS1, reference was also made to some negative or neutral impacts. The most frequently cited negative consequence of HS1 related to the changes in terminus. Terminating at King's Cross-St Pancras and Stratford has opened up new opportunities for businesses/commuters which include the potential for accessing high value job opportunities (e.g. London Docklands). However, disadvantages have also resulted for businesses and commuters who have historically travelled through London Bridge and on to Victoria, Waterloo and West London.

In addition to the above, the following neutral or adverse impacts were identified by stakeholders covering the Kent corridor:

- Some negative impacts on local businesses as parts of Kent are now more exposed to competition for staff – although the benefits for the staff involved may be positive if they can access high paid / better quality opportunities elsewhere;

- HS1 has had little impact on underperforming towns and areas with higher levels of deprivation where socio-economic issues have not been addressed;

- HS1 has promoted outward migration for work for highly skilled residents, but the cost of the service precludes some groups;

- In locations where journey time savings have been less significant, such as in Maidstone, Canterbury and peripheral locations in Thanet, representing stakeholders suggested HS1 has had limited or no impact; and

- Limited impact on land use planning around existing stations that are now connected to HS1 – this was often thought to be as a result of historic physical constraints.

4.6.4.   Summary

The stakeholder interviews have identified a broad range of perspectives on the impact of HS1. Whilst some consistent factors were identified across stakeholder groups and spatially throughout the HS1 corridor, the scale and scope of outcomes has also contrasted within the HS1 corridor.

An overview of the key findings from the stakeholder discussions is outlined in Table 4.14 with findings categorised by their location and coverage.

Table 4.14: Summary of Stakeholder Findings

Coverage	Key Stakeholder Findings
London (King's Cross-St Pancras and Stratford)	• HS1 was seen to have played a catalytic role although this was more in relation to the creating the right conditions in terms of the regeneration of the area, (e.g. through land assembly) than the transport accessibility benefits from the HS1 service itself. • Locations adjacent to HS1 stations have benefitted from high levels of investment, including on wider transport improvements; attribution of this to HS1 is complex. High levels of connectivity locally have also been beneficial. • The role of HS1 in enabling investment and change in the area was thought to be greater (or more apparent) for King's Cross - St Pancras than Stratford. • At Stratford the catalytic role of HS1 was thought to be less significant as a result of wider influencing factors, including the Olympics and wider transport investment.
Kent	• HS1 has played a role in strategic planning in the County with a particular focus on HS1 stations. • Limited take up to date of development sites in strategic areas adjacent to Ebbsfleet and Ashford stations[46]. • Impact on housing market, including house prices, was thought to be more significant than commercial development so far (HS1 supports the case for growth plans). • The change in HS1 terminus within central London - this factor is seen to be as significant as benefits arising from journey time savings to London. • Examples of location decisions being influenced by HS1 were referenced, (influenced by journey time savings), although it was not a large scale impact. • Some negative impacts were noted in relation to outmigration which had resulted in local business being exposed to competition for labour.
Corridor Wide	• Importance of considering external factors (e.g. the recession and existing transport links) was highlighted across stakeholder groups. • It is too soon to fully understand impact of HS1 – some outcomes are only beginning to emerge. • HS1 has become an important marketing tool used to promote locations and business and is seen to have provided a competitive advantage. • Both for London and Kent, whilst HS1 has been beneficial, although the benefits are not universal and do not necessarily support areas with higher levels of deprivation.

4.7. Understanding impacts against the Logic Model

4.7.1. Analysis of Impacts

This section of the chapter brings together the findings of the primary and secondary research to review the extent that anticipated outcomes from the logic model have taken place. It seeks to link the causal pathways that were expected to result from the new infrastructure and in doing so respond to the research questions to establish key factors and specific trends that have shaped the outcomes.

The key research questions were developed as part of the scoping document and included the following:

- How are the outcomes and impacts geographically and socially distributed?

- Is there variability between locations?

- Have the impacts varied between types of businesses?

- What are the observed levels of change?

- Timeframes for the realisation of impacts (including duration)?

In considering the above, consideration has been given to the direction of observed change (positive and negative), identifying the key mechanisms for generating the observed change and whether there are

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[46] The Chancellor announced proposals for building 15,000 new homes near the HS1 station in Ebbsfleet (HM Treasury, March 2014) – this announcement was made after the completion of the primary research undertaken as part of this study.

alternative factors that have influenced the level of observed change. The following regeneration benefits have been considered:

4.7.1.1. Increased footfall and retail spend around stations

An anticipated secondary impact of increased footfall and activity around stations would be greater demand for business premises and increased business rates around the stations. Secondary data analysis around buffer zones within 500m of the station highlighted that **for St Pancras and Ramsgate stations business rates increased faster than for the wider district** however, this was not the case for Ashford where increases were less than half of the district.

It could also be anticipated that increased demand would result in an increase in business premises. When looking at this indicator there was evidence that **the number of business premises has increased faster in the areas surrounding all of the selected HS1 stations than at the district or HS1 Corridor level**. The increase in business premises was particularly apparent around Ashford Station. The increase in business premises may be reflective of a supply side trend that is anticipating future demand that has not yet been fulfilled as a result of the recession.

The interviews with businesses identified a positive perception amongst a number of companies whilst stakeholders referred to positive impacts around some stations. When asked directly about HS1, over a quarter of businesses considered it had improved the local economy, mainly through attracting people to live in the area or through increasing footfall.

> Secondary data and the primary research point to emerging patterns and perceptions of growth and activity that are concentrated around the larger stations. Any future second order impacts on passenger numbers are likely to further consolidate economic opportunities along the HS1 route.

4.7.1.2. Worker and agglomeration benefits

Worker benefits relate to the advantages for staff of reduced journey times. The anticipation of agglomeration factors is reflective of the benefits that improved connectivity supplies as a result of helping existing and potential businesses to interact more effectively.

The secondary data analysis highlighted that over the study period **impact on employment was limited** and in some areas performance was weak. Concerning resident wages, the rate of wage growth in the HS1 Corridor has declined since 2008 and declined in an absolute sense between 2011 and 2012. However this is **reflective of a broader trend of stagnant wage earnings that has occurred nationally since 2008**.

Although it is not possible to identify wholesale positive impacts across the corridor, qualitative interviews were able to highlight some positive factors although the scale of these impacts has been insufficient to significantly affect prevailing levels of economic performance. This is observable in the secondary data:

- Around a fifth of businesses suggested that HS1 had improved business travel and/or improved access for customers and suppliers. Improved business travel was also considered to have enhanced productivity as a result of significantly reduced journey times to London;

- HS1 has improved access for staff and recruitment and retention: businesses in King's Cross, Ashford and Ebbsfleet in particular reported that HS1 had improved the daily commute for their staff;

- A limited number of businesses and some stakeholders referred to advantages of international links afforded by access to HS1;

- Stakeholders in Kent referred to examples of businesses benefitting from access to markets in London (including opening customer facing offices in London whilst maintaining a base in Kent);

- Stakeholders identified how HS1 was enabling businesses to relocate whilst maintaining access to markets including to the emerging knowledge cluster around King's Cross; and

- A high proportion of Kent stakeholders suggested the change in terminus was as significant an impact for both businesses and residents as journey time savings (although impacts could also be negative).

The analysis of secondary data has not clearly demonstrated evidence of enhanced wages in the corridor although qualitative interviews have highlighted an appreciation of areas of opportunity. Future agglomeration benefits are likely to result from enhanced productivity and interaction between businesses and services as a result of connectivity improvements. Enhanced access to labour markets, for businesses, and access to higher value jobs will also support growth in the corridor. The benefits of time savings have been explored in further detail in the Wider Economic Impacts workstream, the results of which are set out in Section 3.

Consideration must also be given to delayed impacts resulting from the lag between decision making and investment. In relation to agglomeration factors there remains potential for future benefits to multiply as second order impacts occur.

4.7.1.3. Investment Climate

The overall influence of HS1 on the investment climate was primarily explored through the qualitative interviews with stakeholders. Whilst it was clear that **HS1 has played an important role in strategic land use planning with a focus around HS1 stations**, the extent that it was seen to be a contributory factor in attracting and levering external investment has varied by station location. Long-term planning and partnership were seen to have been important in ensuring that existing and emerging opportunities for strategic development are maximised around stations.

Stakeholders **emphasised the role of the economic downturn in creating inertia** in terms of business location decisions. This is particularly apparent in the areas around Ebbsfleet and Ashford stations where only a small amount of development has occurred since the opening of HS1 (although stakeholders referred to the role of the Channel Tunnel Rail link in facilitating some earlier development in Ashford

The most significant impact has been at **King's Cross, where HS1 was thought to have had a catalytic impact through the removal of blight** which was required to develop the site. This factor was thought more significant than the access benefits given that the area already has strong transport links. Stratford has also seen large scale regeneration around the station, but, despite the remediating role of HS1 in helping to bring land forward, the specific role of HS1 was less clear given the attractiveness of the area as an Olympic site and wider investment in the area. HS1 was a key element of the overall package of transport infrastructure and service provision that influenced the identification of Stratford as an Olympic site.

Across the rest of the corridor, although stakeholders considered HS1 to be positive its impacts were generally less clear. A limited number of locations, such as Discovery Park (near to Sandwich station), were thought to have benefitted from attracting investment as a result of improved access to London however, where journey times remained high the impacts were thought to be negligible.

The strategic importance of HS1 is clearly demonstrated by the focus of planned development along the route and adjacent to stations. In central London the implementation of HS1, when combined with a number of other significant levers, has made a compelling case for stimulating regeneration activity. Outside of the capital there has been a clear lag between Districts identifying areas of opportunity, business investment decisions and implementation.

4.7.1.4. Real Estate Uplift

The Regeneration Impacts Logic map identifies real estate uplift as a key outcome resulting from an uplifted investment climate associated with the introduction of HS1 passenger services.

Analysis of secondary data suggests that there has been an **increase in demand for commercial real estate in the HS1 corridor** as evidenced by increase in average rateable values (used as a proxy for real estate values) at a faster rate than the Control Corridors. There is also some evidence that this increase has been faster within some of the station buffer zones.

Whilst the signs for commercial real estate are promising it is also important to recognise that:

- Only the immediate impacts of HS1 will have taken effect by 2010 and the next round of VOA valuations may capture further business impacts associated with HS1[47];

- The potential that supply side constraints have put an upward pressure on real estate values; and

- Around St Pancras and Stratford, it will be difficult to distinguish the influence of HS1 from other factors.

As with commercial property, an uplift of residential real estate values is identified as an expected outcome in the Logic Map. Whilst a number of stakeholders referred to positive impacts in the housing market, in Kent, this was not confirmed by the secondary data analysis. No significant uplift in house prices was observed within the corridor as a whole and at the station level, either in anticipation of the service being introduced or following its introduction. **House prices have only increased in line with the national average,** and below the rate of growth in two of the three Control Corridors, although stakeholders and businesses perceived there to have been a positive impact.

However, it should be acknowledged that the period being assessed is one of severe housing market weakness and this may have delayed the potential uplift of house prices. In addition, below corridor average levels of house price growth within the buffer zones may indicate that impacts have occurred across a larger spatial area, particularly for stations that attract commuters from a wide area.

> The review of real estate impacts indicates positive trends for commercial property in the corridor. For residential property, whilst the increased attractiveness of the corridor as a place to commute to London was widely recognised, HS1 does not yet appear to have had a significant impact on house prices over and above background growth.

4.7.1.5. Business Performance and Job Creation

The Regeneration Impacts Logic Map identifies that enhanced business performance and job creation are likely outcomes of HS1. Improvements to the investment climate and agglomeration factors, through enhanced connectivity, can increase the competitiveness of sites and increase productivity enabling companies to enter higher value operations and create new and higher value jobs. As well as improving the performance of existing businesses the logic model also identifies the potential for new businesses to be attracted to the study area.

Whilst there was a perception amongst some stakeholders that HS1 was having a positive impact on employment, **employment data for the HS1 Corridor highlights in the period 2009-11 employment growth was only marginal**. The influence of the recession will have been significant factor in the levels of employment over this period.

Whilst stronger than for the Chelmsford Corridor and comparable with the Milton Keynes Corridor, it was also considerably weaker than for the Cambridge Corridor. In addition, there is limited evidence that employment is increasing at a faster rate around the HS1 stations, a factor reinforced by the level of development that has taken place around HS1 stations in Kent.

Although the evaluation has not alluded to a clear link between the introduction of HS1 and significant impacts upon employment, a number of contextual factors are likely to have been influential:

- The impact of the recession on decision making both in terms of the timing of decisions and the lag between the decision to invest and development (as seen at Ebbsfleet);

- The catalytic role of HS1 in locations where large scale development has taken place (King's Cross-St Pancras and Stratford) where there is also potential for further growth; and

- The potential for future impacts on decision making.

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[47] The Government has introduced a Growth and Infrastructure Bill into the House of Commons which included measures to postpone the next business rates revaluation in England from 2015 to 2017.
(http://www.voa.gov.uk/corporate/News/2012/newsRelease_November_2012.html)

Whilst evidence from the stakeholder and business evidence does not suggest that HS1 would be the primary reason for future location decisions, it may well be a contributory factor as demonstrated by the interest in Ebbsfleet as a location to establish a new theme park.

The logic model also highlights that HS1 would support business as a result of improved competitiveness through supporting increases in turnover, profit and entry into higher value operations. In the interviews with businesses, HS1 and transport in general were not identified a significant factor in relation to business performance. However, when asked directly about HS1, just over a third of companies interviewed identifying that HS1 had had a positive impact on their business.

Both strands of the primary research highlighted that HS1 was providing new opportunities, both in relation to generalised cost savings and reduced overheads and also access to new markets. In addition, stakeholders were able to point to clustering of companies in locations with strong links to HS1.

> Although significant changes in levels of employment have not been seen within the HS1 corridor the impact of the recession and the effects on investment decisions are likely to have been key factors. In relation to individual businesses performance, whilst access to HS1 is unlikely to be transformational, for some businesses it has presented opportunities to make savings and target new markets, in particular for organisations in higher value sectors.

4.7.1.6. Extended Work Horizons

The Logic Map suggests that the extended work horizons of current and future HS1 Corridor residents will lead to higher levels of employment in better paid and higher value jobs. As for a number of other indicators, varying impacts have been seen across the HS1 Corridor.

Stakeholders and businesses suggested a key benefit of HS1 was enabling people to access jobs in the capital either by improving accessibility to parts of Kent or through enabling residents to move out of London and take advantage of reduced journey times. Almost a third of respondents in the business surveys felt that this was a key benefit of HS1.

Although some districts (such as Swale, Shepway and the London Boroughs) have experienced strong resident employment growth, equally the secondary data highlighted parts of the corridor where employment has declined. Resident employment has tended to be weaker in areas where journey times to Central London remain longer e.g. Thanet, Dover and Canterbury. The exceptions to this are Dartford and Gravesham which despite their proximity to Central London have seen declines in resident employment.

Stakeholder discussions also highlighted a perception that work opportunities were not necessarily universal. Reference was made to the fact that for lower skilled workers opportunities afforded by HS1 were less relevant and cost was a significant disincentive. Similarly in central London the types of jobs catalysed by HS1 in locations adjacent to the station are not necessarily accessible to residents from neighbouring areas with higher levels of deprivation.

> Changing levels of employment have varied across the corridor and whilst HS1 is considered to have provided greater opportunities for some residents, the employment opportunities relate primarily to higher value jobs. Although a wide range of influencing factors have influenced employment, including the recession, there is an indication that good access to employment opportunities in the capital is significant.

4.7.1.7. Increase in GVA

The regeneration logic model outlines that an outcome of improved businesses competiveness and growth would be increases in Gross Value Added. GVA per employee data, by sector for local areas, was used to provide a high level estimate of likely change in GVA levels associated with the changing employment patterns at the corridor level (using 2010 prices).

The changing employment profile is estimated to have resulted in an increase in GVA in the order of £190m in the primary corridor. Whilst smaller than the increases associated with employment change in Control Corridor 1, it is a stronger performance than for Control Corridors 2 and 3 which experienced reductions in GVA levels over the same period (N.B. these estimates exclude any general or 'within sector' improvements in productivity within each corridor).

Whilst it is estimated that there has been positive growth in the HS1 corridor this is primarily driven by growth in high value sectors within central London. In these locations GVA per employee is generally higher and there is also a wide range of factors that have influenced growth. Although HS1 will have played some role in allowing this growth to take place, there is insufficient evidence to quantify impact.

4.7.2. Attribution of impacts including wider context

The evaluation of regeneration impacts has considered the extent that any changes in performance or socio-economic conditions have been as a result of HS1. The primary research has sought to gauge the scale of impact and the extent that causal pathways have been followed.

The revised primary research methodology does not provide a sufficient number of responses to provide a clear assessment of net impacts or directly apportion a ratio of attribution relating to HS1. However, the following emerging themes have provided an indication of the scale of influence:

- HS1 has clearly had a significant role in influencing strategic planning at key regeneration sites across the corridor, although the extent HS1 had catalysed investment varied significantly. In central London the impact has been considerably greater than in Kent;

- The impact of remediation and land assembly were seen to be more significant than transport links;

- The interviews with businesses suggested limited evidence of direct impact of HS1 on businesses location decisions, financial turnover and staff recruitment and retention;

- A proportion of businesses did perceive that HS1 had a positive effect on property values and transport conditions (including for business travel and access for customers and suppliers) but this was not corroborated by secondary data; and

- When prompted about the impact of HS1 on the local area and economy, the majority of businesses thought HS1 had played a positive role although distinguishing from wider factors is challenging. Businesses were not able to attribute a specific increase in turnover or profit to HS1.

Common to both the stakeholder and business interviews was the acknowledgement that the socio-economic trends within the HS1 corridor, and also control corridors, had been influenced by a wide range of factors.

By far the largest externality raised in the primary research was the **influence of the recession** on economic performance and investment. Businesses performance was seen to be largely constrained by the economic climate and investment decisions had been delayed throughout this period thereby slowing the rate of development.

Existing social and economic profiles were also highlighted as being significant, in particular in London. In the capital, the scale of change in accessibility afforded by HS1 is only proportional to the existing transport, labour force and market forces. Similarly, stakeholders saw HS1 as having less influence on areas with longstanding deprivation, with benefits relating more to comparatively high skilled employment markets.

Local planning had clearly played a role in shaping where regeneration activity is to be focused with Local Authorities and regeneration partners specifying that development plans such as King's Cross and around Ebbsfleet and Ashford had, or are, being designed to take advantage of HS1. This synergic relationship between two drivers for change has ensured that activities have had a reinforcing role although the balance of change has varied between sites.

The **impact of the Olympics** was thought to be localised to the Stratford area although there was a clear acknowledgement that even without HS1 this part of London would have been attractive as an Olympic site.

Whilst HS1 has played an influencing role in shaping socio-economic performance, stakeholders and businesses stressed that overall HS1 was only one of a range of factors, not least the impact of the economic downturn, that are relevant.

4.8.   Summary and Testing the Hypotheses

The evaluation of regeneration impacts has taken a triangulated approach consisting of primary research with stakeholders and businesses, analysis of secondary data and use of comparator areas. The final section of this chapter concludes through revisiting the central hypothesis that have been tested through the evaluation and providing an overview of the impacts of the scheme.

Table 4.15 and Table 4.16 below provide an evidence-based response to the first and second order hypothesis and provide a qualitative assessment of impact based upon the evidence. An assessment of the impacts has also been made using a standard contextual seven point scale (large beneficial, moderate beneficial, slight beneficial, neutral, slight adverse, moderate adverse and large adverse).

Table 4.15: First Order Regeneration Benefits

	Hypothesis	Impact	Evidence
1.	**Employment**: Implementation of HS1 has created new (additional) employment and safeguarded existing employment in the corridor as a whole and around the key locations.	Slight beneficial	• Secondary data highlighted variability in resident employment across the corridor with some areas performing poorly. • Workplace performance across the corridor has performed poorly although at the headline level, it has increased marginally over the two year period 2009-11. • There is limited evidence that employment is increasing at a faster rate around the HS1 stations. • Results for business premises suggest that there has been no significant increase in office supply to date which can accommodate new or growing businesses. • Interviews with businesses did not highlight HS1 as being a significant factor in employment decisions.
2.	**Economic Output:** Implementation of HS1 has brought about an increase in GVA at the level of the overall corridor and at the level of key locations.	Slight beneficial	• Estimated changes in the level of GVA (2009-11) associated with the changing employment profile, was higher in the HS1 corridor than in two of the three control corridors. This is primarily associated with sectors where GVA per employee is higher in the HS1 corridor than the national average (primarily in London). HS1 has played some role in facilitating this growth in London.

Table 4.16: Second Order Regeneration Benefits

	Hypothesis	Impact	Evidence
1.	**Real estate uplift:** Property values and rents at the key locations specified in the brief are higher as a result of the implementation of HS1.	Moderate beneficial	• Average rateable values have increased faster within the HS1 Corridor than the three control Corridors. • Indication that the increase has been faster within some of the station buffer zones. • Business interviews identified a positive perception of impact on land and property amongst over a quarter of companies in relation to land and property price. • House prices have only increased in line with national levels.
2.	**Business performance:** Implementation of HS1 has improved business performance (employment and turnover) in the corridor as a whole and around the key locations.	Slight beneficial	• Employment data for the HS1 Corridor highlights relatively poor performance, even when taking into account the challenging business environment of the past five years. • Enhanced business performance was not identified as a key impact amongst stakeholders although businesses identified that improvements for business travel provided by HS1 positively impacts on their performance.
3.	**Investment climate:** Implementation of HS1 has enhanced perceptions of the key locations specified in the brief.	Moderate beneficial	• Catalytic role of HS1 at King's Cross and to a lesser extent Stratford (although remedial role more significant than journey time savings) • Delay in realising investment at Ebbsfleet and Ashford (impact of recession). • Less impact in locations where accessibility improvements have been less significant.
4.	**Economic development:** Implementation of HS1 has contributed positively towards objectives for economic development and regeneration.	Moderate beneficial	• HS1 has played a key role in land use planning for some of the largest regeneration projects nationally. • Lag between strategic planning and investment decisions which has delayed regeneration. • Wide range of other factors thought to be as significant as HS1, including inertia in location decision making as a result of the recession.

4.9.   Summary

The evaluation of regeneration impacts has identified that at this stage performance against the range of outcomes that were outlined in the logic map has been variable. Although positive impacts have been evidenced in some areas in relation to real estate and economic development/investment particularly around King Cross, there is little conclusive evidence for other key indicators such as employment and economic output.

Opportunities for impacts to be realised have been limited by the relatively recent introduction of the domestic HS1 passenger service and the lead in times associated with business investment decision making and implementation. This is further compounded in lags concerning the analysis and publication of relevant local level secondary data and the impact of the national recession, which is likely to make many businesses postpone costly or risky investment decisions until certainty concerning future demand returns.

The likely inertia in business and investment location decisions associated with the recession and the inherent lag between decisions and investment activity will have limited the extent that the corridor has been able to exploit competitive advantages. Locations where large scale investment has taken place (primarily central London) are areas where the impact of the recession were less keenly felt and also where significant amounts of complementary activity have taken place. Furthermore, Kent stakeholders and businesses

pointed to a number of positive impacts of HS1 including land/property prices and benefits associated with improvements in business travel.

It is possible that regeneration benefits will be experienced in other parts of the HS1 corridor and these could be subject to further evaluation in the future. For example, as we emerge from the recession, prospects are now more apparent as confidence returns. There are significant opportunities to exploit sites with access to HS1 (as can be seen with proposals at Paramount Park adjacent to Ebbsfleet Station) and the transport links can provide a competitive advantage over other areas, although wider factors are likely to be of equal or greater significance. As travel patterns consolidate there is also further potential to embed patterns of agglomeration as links become established.

5. Government Shareholdings and Asset Values

5.1. Introduction

In this workstream we consider the value of the assets owned by the Government which are related either directly or indirectly to the HS1 project. There are two main objectives:

- To calculate the current absolute net value of all existing HS1 related Government assets; and

- To isolate the incremental impact of HS1 on this value, by calculating the incremental value with respect to a counterfactual scenario without HS1.

We also consider the outcome of a counterfactual scenario where the financial restructuring in 1998 and 2002 of LCR (London Continental Railways), which owns the HS1-related land and property assets, did not take place. Again we consider the incremental value of HS1 by comparing the actual outcome and a potential counterfactual outcome.

5.1.1. Background[48]

As explained in more detail in Section 1 above, as a result of the HS1 project, the Government ended up with a portfolio of assets & liabilities on its books. HS1 was to be built under a PFI (private finance initiative) contract which was won in 1996 by the private company LCR. However, by 1998, LCR had encountered serious financial difficulties and Government stepped in with a restructuring package. A further restructuring also became necessary in 2002 after elements of the previous plan became unworkable. By 2009, the Government took the decision to buy LCR from its shareholders, separate it into its constituent businesses, and then invest in HS1 Ltd (which would hold the concession to operate the HS1 infrastructure) in preparation for its sale. This meant that from that point onwards, the Government, in effect, owned all of LCR's property development assets, a 40% stake in Eurostar, the HS1 freehold, LCR's debt and other less significant assets and liabilities. Due to the financial problems encountered by LCR, which had not been foreseen at the start of the project, the Government became far more heavily involved than they originally expected. One significant outcome of this was the transfer of substantial assets and liabilities into Government ownership and it is this portfolio that we have considered in our analysis.

This chapter is structured as follows:

- First we briefly summarise our analytical approach, which is described in more detail in the project Scoping Report, provided as an appendix to this Report;

- We then present a comprehensive summary of all HS1-related shareholdings and assets that the Government currently holds and any associated liabilities that it is responsible for. For each key asset or liability, we also provide an estimate of its current value in absolute terms;

- Then, starting from the same point at which Government assets were transferred to LCR in 1996, we define a potential counterfactual scenario, capturing the evolution in the value of the same assets had HS1 not been developed. This counterfactual scenario "without HS1" is consistent with that used across all the other workstreams in the ex post evaluation of the impact of HS1;

- This allows us to identify the incremental change in the value of the portfolio of Government-owned assets and liabilities attributable to the HS1 project by comparing their absolute value with the counterfactual value; and

- Finally, we also discuss the impact of the financial restructurings of LCR that the Government undertook in 1998 and 2002, exploring in a qualitative manner, the potential implications of LCR not being rescued at each point in time.

As we argue below, in order to avoid double-counting, the asset valuation resulting from this workstream should not be considered as additional to the impacts identified by other workstreams. Specifically, the

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[48] Based on "The Channel Rail Tunnel Link, Report by the comptroller and auditor general, 28 March 2001", NAO & "Progress on the Channel Rail Tunnel Link, Report by the comptroller and auditor general, 21 July 2005"

increase in land value that HS1 has generated is expected to be fully captured by the "regeneration" workstream. In effect, we identify the share of this incremental value which can be attributed to the Government, because of its involvement in HS1.

5.2. Summary of our Approach to Government Asset Valuation

The Evaluation Scoping Report, provided as Appendix A to this report, provides an overview of the approach that we have used to complete the analysis for this workstream.

To summarise, we have structured our analysis according to the following steps:

- **Step 1.** Identify the existing asset portfolio (and the associated liabilities);

- **Step 2.** Determine the current value of all the assets and liabilities, as they are now;

- **Step 3.** Determine the absolute net value (i.e. after offsetting any relevant liabilities) of the Government-owned assets;

- **Step 4.** To calculate the incremental impact of HS1, however, we need to define a counterfactual scenario where HS1 had not happened;

- **Step 5.** We can then consider the approximate value those remaining assets would have had if the HS1 project had not been pursued; and

- **Step 6.** This allows us to express the current value of assets in incremental terms.

Our valuations reflect the present value of the relevant assets and liabilities. Consequently, for example, any forecast future income streams relating to property assets are taken into account only until their expected sale date, at which point the expected sale price is also incorporated.

Finally, we also attempt to consider how the key restructuring events in 1998 and 2002, when the Government had to intervene in LCR's financing and operations, might have affected the Government asset portfolio. This is both in terms of the portfolio's composition and its value. In other words, we look at what could have happened absent the financial restructuring which occurred in 1998 or 2002.

5.3. HS1 Related Assets and Liabilities

The first step in our approach is to identify all of the assets and liabilities which the Government currently owns and owes, respectively, which can be traced back to HS1. Figure 5.1 below summarises all of the relevant elements. Please note that the percentages reflect shareholdings.

Figure 5.1: What does the Government own / owe?
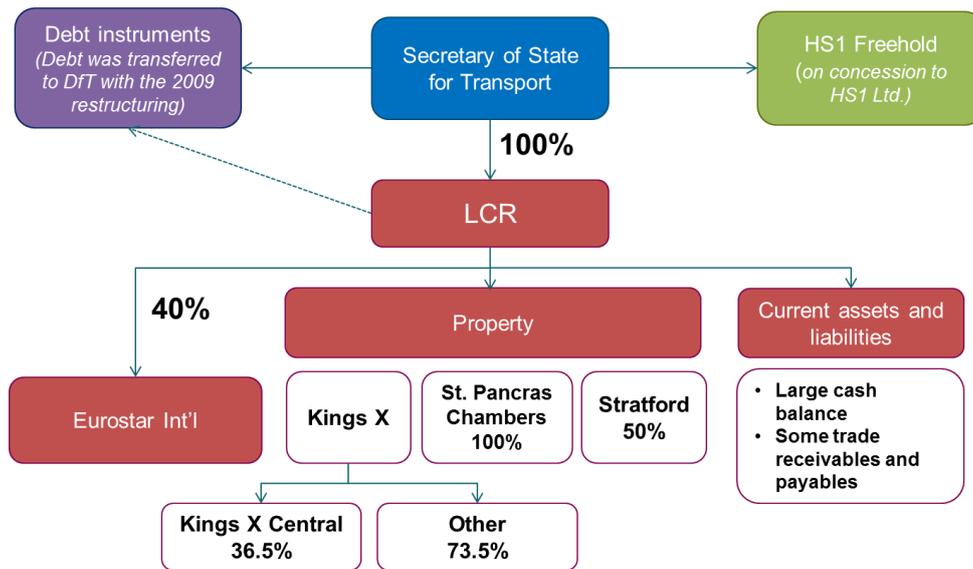
Source: LCR and DfT financial statements, LCR business plan 2013-2018, NAO HS1 report, face-to-face meetings & other correspondence

In the rest of this section, we therefore initially consider the relevant assets and liabilities held by LCR and then those which are directly held by Government.

5.3.1. LCR's current structure and investments

Today, LCR is a wholly-owned Government company with an independent Board, which owns extensive freehold land and property development assets which were made available as a result of the HS1 project. LCR has a number of subsidiaries, associates and joint ventures, including a 40% shareholding in Eurostar International Limited (EIL).

The LCR Group's current structure and investments are shown in Figure 5.2 below.

Figure 5.2: LCR Group Structure
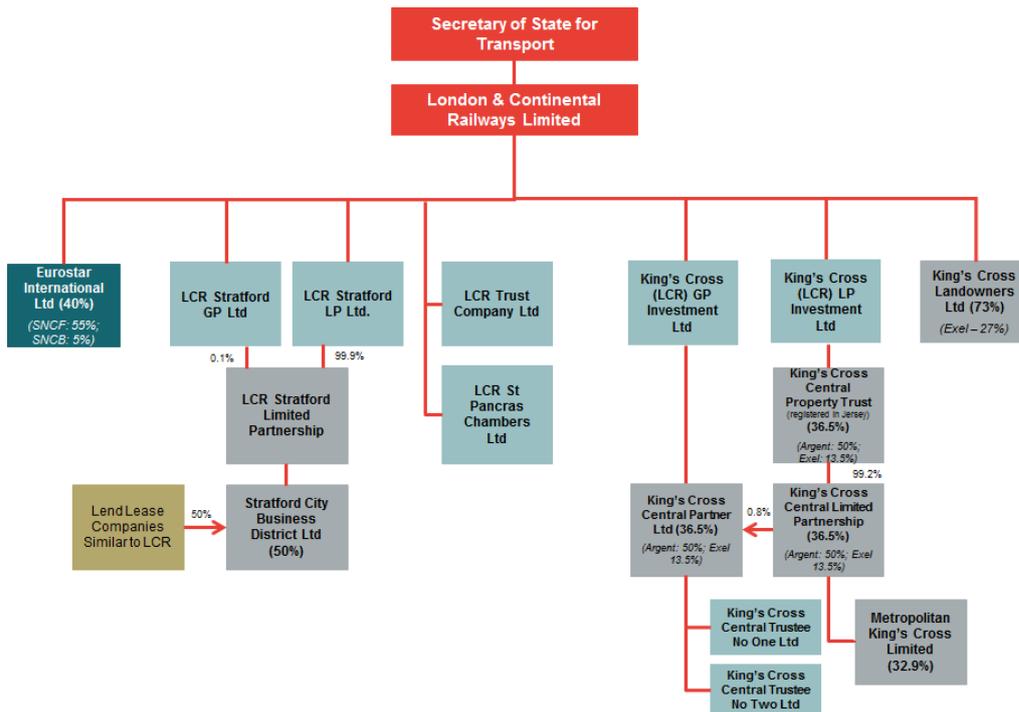
Source: LCR draft business plan 2013-18 (July 2013) and Group Report & Accounts (31 March 2013)

LCR's interest in the King's Cross Central Partnership is held via a 100% interest in subsidiary companies KXC (LCR) GP Investment Limited and KXC (LCR) LP Investment Limited. The latter subsidiary holds 36.5% of the units in a property unit trust registered in Jersey which owns the King's Cross Central Limited Partnership.

The Company's interest in the Stratford City Business District Joint Venture is held via a 100% interest in subsidiary companies LCR Stratford GP Limited and LCR Stratford LP Limited, which in turn hold 100% of LCR Stratford Limited Partnership, which has a 50% holding in Stratford City Business District Limited.

The LCR Group and Company's key investments (both those which are directly and indirectly held) are set out in Table 5.1 below. Most of these relate to LCR's property investments which are often structured as separate entities.

Table 5.1: LCR Group Investments in Subsidiaries, Associates and Jointly Controlled Entities

Group	Type of investment	% of ownership
Eurostar International Ltd	Associate	40%
King's Cross Central Limited Partnership	Associate	36.5%
Stratford City Business District Limited	Joint Venture	50%
LCR St Pancras Chambers Ltd	Subsidiary	100%
Metropolitan King's Cross Ltd	Associate	32.9%

Source: LCR Group Report & Accounts 31 March 2013, p.34

Table 5.2 summarises the property and non-property assets which LCR directly or indirectly owns (via its various investments) and which the Government therefore ultimately owns. Each of these assets is then described in turn.

Table 5.2: Summary of LCR's non-Current Assets

Type of asset	Description of Asset
Property assets	King's Cross: • King's Cross Central – major regeneration development site • St Pancras Chambers (hotel) • King's Cross Northern Lands
	Stratford: • Stratford City – The International Quarter – major regeneration development site • Freehold N24 Stratford hotel site • Chobham Farm North/Leyton Road • Chobham Farm South • Bus layover Stratford
	Other surplus former HS1 properties: • Smaller light industrial/distribution sites in east London, Thurrock and north Kent • A number of agricultural sites • Two contaminated land sites bought to facilitate the construction of HS1
Non-property assets	Eurostar International Limited (40% shareholding)

Source: LCR business plan 2013 - 2018

Broadly, we can identify two main categories of non-current assets – the property assets (divided into those located in King's Cross & those located in Stratford) and the non-property related assets which are the Eurostar International shares.

LCR is the landowner of two HS1-related sites with planning permission for major mixed-used regeneration at King's Cross and Stratford. It also owns the freehold on the newly refurbished St Pancras Renaissance Hotel and other sites. LCR's property assets were all brownfield sites of low value, which turned into development opportunities over the course of the HS1 construction project[49].

In addition, LCR has a stake in Eurostar. This investment formed part of the original PFI structure set up by Government for LCR to build and operate HS1. The privatisation of British Rail (BR) saw the ownership of European Passenger Services (the division of BR responsible for operation of UK Eurostar services) transferred to LCR in 1996. LCR renamed the company Eurostar (UK) Ltd (EUKL) and was to use the income from EUKL to help finance the HS1 project.

The three parties with interests in Eurostar services in the UK (LCR); France (SNCF) and Belgium (SBCB) merged their interests into Eurostar International Limited (EIL), which was incorporated on 1 September 2010. LCR owns a 40% stake; SNCF 55%; and SNCB 5% of EIL, respectively.

5.3.2. LCR's current assets & liabilities

In addition to these non-current assets, LCR has some current assets in the form of a large cash balance and some trade receivables. Its current liabilities are minimal and include some trade payables. LCR does not hold any debt as this was transferred at an earlier stage to DfT, as discussed below.

5.3.3. Other relevant assets & liabilities

5.3.3.1. HS1 infrastructure

In 2010, the HS1 infrastructure was sold by LCR. This formed part of the Government's plan to restructure LCR into its component businesses. The DfT retained the freehold for the infrastructure while HS1 Ltd purchased a long-term concession to November 2040. Consequently, we have included the freehold over the HS1 line in our portfolio of relevant Government owned assets & liabilities.

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[49] LCR also anticipates the transfer of further property assets from BRBR (British Railway Boards (Residuary)) going forward, but as these are unrelated to the HS1 project, we have not considered them here.

5.3.3.2. Debt

In June 2009, as part of the final restructuring, LCR transferred ownership of two special purpose vehicles, which together were liable for £5.169bn of debt in the form of bonds and securitised notes, to the DfT. This debt was already supported by a range of Government guarantees but now DfT was responsible for the interest and capital payments on all of this debt. Table 5.3 below sets out the debt instruments held by CTRL Finance Plc and LCR Finance Plc which were formerly owned by LCR and transferred to DfT in 2009 as part of the Government's restructuring of LCR, as at the time of the transfer.

Table 5.3: DfT's Debt (HS1 related)

CTRL Finance Plc			
Issue date	**Government-backed bonds**	**Face value (£m)**	**Maturity date**
Nov 2003	Class A1: 5.234% (fixed)	748	2035
Nov 2003	Class A2: 2.334% (index-linked)	500	2051
LCR Finance Plc			
Issue date	**Asset-backed notes**	**Face value (£m)**	**Maturity date**
Feb-99	4.75% (fixed)	1,000	2010[50]
Feb-99	4.50% (fixed)	1,225	2028
Feb-99	4.50% (fixed)	425	2038
Jun-02	5.10% (fixed)	1,100	2051

Source: Diagram 4, p.14, "Progress on the Channel Tunnel Rail Link", NAO, 21 July 2005

5.4. Current Absolute Net Asset Value

We can now construct an estimate of the current net value of all the relevant Government-owned assets and liabilities. In this section, we discuss how we have valued each element and then present the overall current valuation (as at 31st March 2013) of the total assets and the total net assets. We present the results as a range, due to the uncertainty surrounding some of the valuations.

5.4.1. Absolute value – property non-current assets

We start by considering the absolute value of each of the property non-current assets held by LCR.

5.4.1.1. Sources used

To value these assets we have considered:

- the carrying value included in LCR's year-end 2013 financial statements;

- professional valuation reports requested by LCR as at year-end 2013 (for non-statutory accounting purposes); and

- the carrying value included in DfT's year-end 2013 financial statements (as they are the ultimate parent of LCR they also need to incorporate any assets or investments held by LCR).

These three sources often provide different valuations. For each form of property investment (joint ventures & associates, subsidiaries, directly owned), we discuss in Annex C the different methodologies used and how we have used these to generate a valuation range for each asset.

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[50] Note that this asset-backed note has since matured.

5.4.1.2. King's Cross

King's Cross Central

King's Cross Central is a 67 acre mixed-use regeneration development that will deliver over 1,900 homes, 23 new and refurbished office buildings, 500,000 sq. ft. of shops and restaurants, 20 new streets and 10 major new public spaces. It also involves the restoration of 20 historic buildings.

King's Cross Central General Partnership Limited (KCCGP) is the special purpose vehicle formed to implement the development of the site. KCCGP holds the entire site, of which Argent/Hermes has a 50% stake; DHL (a subsidiary of Deutsche Post) has 13.5%; and LCR holds the remaining 36.5% in addition to loans of approximately £50m.

The development is already part completed and occupied by commercial, leisure, and residential occupants, as well as staff and students from Central Saint Martin's College of Art and Design. If development continues according to plan– with only currently-known tenants signed – then 50% of the scheme will be delivered and 85% of the site-wide infrastructure will be in place by 2014. It is expected that the whole scheme will be completed within 15 years.

Jones Lang LaSalle's valuation report (which estimated the value of LCR's overall share of the KXC JV on behalf of LCR) dated year-end 2013 proposes a central market value of £245.8m. The associated sensitivity analysis generates a low and high value of £181m and £317m.

The DfT's valuation, as presented in their year-end 2013 financial statements, representing 36.5% of the partnership's net assets, is £199.6m and therefore within the range implied by the valuation report. Consequently, we have used the range of £181m – £317m in our analysis.

King's Cross Northern Lands

This site, which LCR has a 73% share in, consists of the EWS cement batching plants, Camden Depot and a relocated Metroline bus depot, north of King's Cross Central. These are all long-term leased properties with limited rental income. This land was subject to an option agreement with the King's Cross Central Partnership, although by June 2013, this had lapsed. LCR is now looking to sell its interest.

GL Hearn's valuation report, prepared for LCR and dated year-end 2013, proposes a central market value of £4.08m of which LCR owns a share of £2.98m. In addition, the report proposes an alternative market valuation on the special assumption that the option agreement is not exercised by the King's Cross Central limited partnership (in which case LCR becomes the direct landlord). GL Hearn calculates this to be £3.88m or £2.83m in terms of LCR's share. As our analysis is carried out as of 31st March 2013 (i.e. before the option had expired), we have used a valuation range in our analysis of £2.8m – £3.0m.

St Pancras Chambers Hotel

LCR owns the freehold of the Grade 1 Listed St Pancras Chambers – now the St Pancras Renaissance Hotel, which was developed by Manhattan Loft Corporation (MLC) and Marriot. This includes a hotel which was opened in May 2011 and 66 apartments. The hotel is under a 25 year management contract subject to minimum income and the apartments were sold on 125 year leases to owner occupiers/investors.

As this is an immaterial asset, in 2013 a "director's valuation" of £0.1m was used, based on the 2012 revaluation report produced by Jones Lang Lasalle. We have therefore, relied on this single point value of £0.1m.

5.4.1.3. Stratford

Stratford International Quarter

During 2010, LCR achieved unrestricted control of Zones 2 and 3 (commercial development plots) of the Olympic Village, known as 'The International Quarter'. This comprises the final 22 acres of the original Stratford City master plan – approximately four million sq. ft. of mixed commercial and residential development, including 350 new homes. LCR has a 50% share in Stratford City Business District Ltd (SCBD), a 50/50 joint venture with Lend Lease, formed to develop this land.

International Quarter is at an earlier stage of regeneration than King's Cross Central, with development not due to commence until 2015. The site is currently being marketed to large corporations and financial

institutions. The SCBD Business Plan aims to sign one significant tenant during the 2013/14 financial year. If no development takes place on The International Quarter by 2016 then there is a provision for either party to unwind the joint venture. In addition, any land that has not been drawn down by 2024 will revert to LCR.

Jones Lang LaSalle's valuation report (which estimated the value of LCR's overall share of the SCBD JV) dated year-end 2013, proposes a central market value of £29.7m. The sensitivity analysis generates a low and high value of £2.2m and £69m. It is a wide range, due to the greater uncertainty associated with the early stage of development.

The DfT's valuation, representing 50% of this entity's net assets and incorporated in its own year-end 2013 financial statements, is £19.96m and therefore within the range determined above. Consequently, within our analysis, we have relied on a valuation range for this asset of £2.2m to £69m.

Plot N24

Plot N24 is a 0.7 acre plot on the Stratford City site. LCR sold a 250-year lease on this site to the Manhattan Loft Corporation (MLC) for the construction of a 42 storey hotel and residential tower in 2011. Under this lease, LCR will receive an initial premium of £1.5m for the hotel element (in two instalments of £750,000), and a further £1m for the residential element, if completed. Planning consent has been granted but MLC is awaiting a significant level of pre-sales and the signing of a hotel operator before construction will begin.

As this is an immaterial asset, in the 2013 financial statements, a "director's valuation" of £0.1m was used. This was based on the 2012 revaluation report produced by Jones Lang LaSalle of £0.8m less the first £0.75m instalment of the initial premium which was payable in May 2012. Consequently we have relied on a point estimate of £0.1m.

Chobham Farm North

LCR also owns land to the east of Stratford City. The largest site (8.5 acres) is Chobham Farm North, which is currently leased to the ODA (Olympic Development Authority) for storage purposes. LCR has negotiated a 'memorandum of understanding' with adjoining land owners Newham Council and East Thames Housing Group. This provides for a land-pooling agreement and joint development approach. It includes a total of 15 acres and could deliver 1,000 residential units as well as some further employment uses. Although a planning application was being prepared, at year-end 2013 planning permission had not yet been granted and a development partner had yet to be selected.

GL Hearn's valuation report dated year-end 2013 and produced on behalf of LCR, proposes a central market value of £16.9m. This is based on certain assumptions about the future development (see Annex 2 for more details) and there is no sensitivity testing around this. The "existing use value", assuming that the land continues to be used for storage and is undeveloped is estimated to be £7.72m and provides a natural lower bound for our valuation range. Consequently, in our analysis, we have used a valuation range of £7.72m - £16.9m.

Chobham Farm South

Chobham Farm South is a 4.67 acre tarmacked site which is currently vacant. Its most recent use was as a coach park, leased to the ODA for the Olympic Games. The site has an option and pre-emption in Westfield's favour which LCR is currently negotiating to reduce to an 18-month sale agreement. Again, there is currently no planning permission or specific development plans.

Deloitte's valuation report dated year-end 2013 proposes a central market value of £6.0m. This is based on certain assumptions about the future development (see Annex 2 for more details) and there is no sensitivity testing around this. The "existing use value", assuming that the land continues to be used for storage and is undeveloped is estimated to be £4.6m and provides a natural lower bound for our valuation range. Consequently, in our analysis, we have used a valuation range of £4.6m - £6.0m.

Bus layover Stratford

LCR has an obligation to grant a long interest to Transport for London for use of this site by buses and provision of taxi bays. Currently, only a planning permission for this purpose is in place.

As this is an immaterial asset, in LCR's 2013 financial statements a "director's valuation" of £0.05m was used, based on the 2012 revaluation report produced by Jones Lang LaSalle. We have therefore relied on a point valuation estimate of £0.05m.

5.4.1.4. HS1 line

The Concession Agreement between the Secretary of State and HS1 Ltd grants HS1 Ltd the concession for the operation, financing, and the repair, maintenance and replacement of HS1. Under the terms of the Concession Agreement, HS1 Ltd has the right to sell access to track and stations on a commercial basis, while having to maintain the high-speed railway network effectively. On expiry of the current concession (in November 2040), the Government will resume full use of the line with the opportunity to let a further concession. However, over this whole period the freehold on the infrastructure is retained by DfT.

In DfT's financial statements, the freehold on the HS1 infrastructure is treated as a non-current asset with an expected useful economic life of 90 years. The carrying value at year-end 2013 is £3.377bn which reflects both the "enterprise value" determined during the bidding process for the current concession and the present value of the future receipts which could be expected during any subsequent concessions over the remainder of the asset's life. Therefore, this is the value which we have included in our analysis.

5.4.2. Absolute value – non-property non-current assets

5.4.2.1. Eurostar

As explained earlier, LCR's shareholding in Eurostar is an artefact of the original PFI structure. Even though the income generated was insufficient to enable LCR to attract the private finance it needed, it still continues to hold 40% of Eurostar International's shares.

LCR equity accounts for this associate and therefore values its investment at 40% of Eurostar's net assets which it states as £323.4m. Although DfT does the same, it does not appear to be relying on the same "internal results" from Eurostar as LCR has, as it values this investment at £311.8m. We understand that EIL's financial statements have a December year-end and we assume that LCR's stated valuation would have taken this into account and therefore is more reliable. Therefore, in our analysis, we have relied on a point valuation estimate of £323.4m.

5.4.3. Absolute value – current assets

5.4.3.1. Inventories

This represents other sites which are expected to be sold within the next year. These properties are transferred from non-current to current assets and valued at cost in LCR's accounts at £3.9m. This is the valuation we have used in our analysis.

5.4.3.2. LCR's cash

LCR has a very large cash balance of £91.4m as at year-end 2013 as shown in its financial statements. This cash is expected to finance LCR's operations until the long-term distributions from and capital appreciation in the value of its investments can be realised. We have therefore used a valuation of £91.4m in our analysis.

5.4.3.3. LCR's trade receivables

LCR's trade receivables amounted to £9.5m as at year-end 2013 as shown in its financial statements. This represents income which was due to LCR at the year-end but had yet to be settled in cash.

5.4.4. Absolute value – liabilities

5.4.4.1. LCR's trade payables

LCR's trade payables amounted to £13.6m as at year-end 2013. This represents amounts which LCR owed its suppliers at the year-end but had yet to be settled in cash.

5.4.4.2. Debt

As explained above, currently, LCR holds no debt itself as all of the debt instruments it had issued are now held by DfT. We rely on the carrying value shown in DfT's financial statements for year-end 2013 of £4.2099bn to value this debt. This represents the present value of the future payment obligations of each debt instrument. This seems a more appropriate valuation basis than the fair value (which is presented in the notes to the accounts and amounts to £5,323), which represents the estimated current market value, based on the latest observed trade price. As it seems unlikely that this debt would be sold, such a valuation base seems less relevant.

5.4.5. Absolute net asset value

Table 5.4 summarises the valuation described above.

Table 5.4: Absolute Valuation of HS1-Related Assets & Liabilities

Asset / liability	Low (£m)	Mid-point (£m)	High (£m)
Non-property assets			
Eurostar International Ltd	323.4	**323.4**	323.4
Property assets			
HS1 Ltd freehold	3,377.0	**3,377.0**	3,377.0
LCR's property / land portfolio	199.7	**302.6**	414.1
Total Non-Current Assets	**3,900.1**	**4,003.0**	**4,114.5**
Net current assets			
LCR's current assets	104.8	**104.8**	104.8
LCR's current liabilities	- 13.6	**- 13.6**	- 13.6
Total Net Current Assets	**91.2**	**91.2**	**91.2**
Total Assets Less Current Liabilities	**3,991.3**	**4,094.2**	**4,205.7**
Debt			
DfT's debt instruments	(4,209.9)	(4,209.9)	(4,209.9)
Total Net Assets	**(218.6)**	**(115.7)**	**(4.2)**

Source: Frontier analysis / See Annex 1

As shown in the table, total non-current assets are valued at £4.003bn (within a range of between £3.9001bn and £4.1145bn.). The variation is given by the uncertainty surrounding the valuation of the Stratford property development. This uncertainty is due to the fact that the development is at an earlier stage than the land at King's Cross and planning permissions have not yet been granted on all plots.

After taking into account LCR's net current assets and, more importantly, the £4.2m of debt which is now held by the DfT, the overall net assets fall to -£115.7m (within a range of -£218.6m and -£4.2m.). This shows how the debt instruments which were issued in relation to HS1 and transferred to the Government should not be overlooked. While the net asset value is negative, we note that the whole project, which was funded by this debt, has had a much broader impact, as explored in the other workstreams.

5.5. Incremental Impact of HS1 on Asset Values

As explained above, we seek to calculate the incremental impact of HS1 on Government-owned assets. To do so, we need to construct a counterfactual scenario assuming that the HS1 project had not been pursued, using the approach set out above.

We discuss this below, before presenting our valuation of HS1's incremental impact.

5.5.1.   Counterfactual - without HS1

We begin by considering which of today's assets and liabilities should be included in the counterfactual. We consider firstly, whether each would have existed if HS1 had not happened and secondly, whether they would still be in Government ownership. Only if each item passes both tests should it be included in our counterfactual scenario. Table 5.5 below sets out our assessment of which assets and liabilities should be included.

Table 5.5: Portfolio of HS1 Related Assets & Liabilities without HS1

Assets & liabilities	Existence? *(without HS1)*	Ownership? *(without HS1)*
Property & land		
King's Cross	✓	?
Stratford	✓	?
St Pancras hotel	✓	?
Eurostar Intl.	✓	✘
HS1 Freehold	✘	✘
Current assets	?	✘
Current liabilities	?	✘
Debt	?	✘

Source: Frontier analysis

The Government originally had sole ownership of the land at King's Cross, Stratford and St Pancras Chambers. It transferred this to LCR in 1996. If the HS1 project had not been pursued, we can therefore assume that these property assets would have stayed in Government ownership. Note that in 2011, four Government departments, including DfT, developed a land strategy to sell surplus sites. It is therefore possible that had these sites stayed in Government ownership in 1996, they would have been sold as part of this strategy as they represented prime, brownfield development sites. If this was the case, then it would be feasible to assume that by February 2013, the Government would no longer own this land. As we have no way of knowing whether this would be the case or not, we consider two possible counterfactuals in order to generate a range of outcomes.

5.5.2.   Counterfactual 1 - Land in Government's ownership

We can conclude the following regarding the impact on the portfolio of HS1 related assets & liabilities under this version of the counterfactual.

Property assets held by LCR - in this case, if the HS1 project had not happened, all of these assets would still have existed and be owned by the Government. Therefore they should be incorporated under the counterfactual scenario.

Eurostar - Eurostar's services were already in place in 1996 and therefore would have continued to exist with or without the HS1 programme. However, the only reason that LCR had a stake in Eurostar was because it was hoped that the income raised from this entity would help to fund the HS1 project. Without HS1, it is highly likely that Eurostar would have been privatised as part of the franchising process, as it happened for other rail services in the UK during the privatisation process. Consequently, although Eurostar would have existed in the counterfactual situation, we do not believe it would have remained under Government control to this day. Therefore it should not be included in the counterfactual.

HS1 freehold - It is clear that if the HS1 project had not been pursued then the HS1 infrastructure would not have been built. We can therefore exclude this from our counterfactual scenario.

Current assets / liabilities - the current assets and liabilities associated with the development of this land and the long term debt issued to finance the development would not have existed without the HS1 project. We therefore exclude these assets and liabilities under this version of the counterfactual.

Debt – the debt issued by LCR in relation with the HS1 project would not have existed if the land was transferred back to the Government and remained dormant.

In conclusion, only the land and property which was transferred to LCR and later came back under Government's ultimate ownership would still have been owned by the Government without HS1 going ahead. This forms the basis of this version of the counterfactual scenario.

5.5.3.   Counterfactual 2 - Land in private ownership

We can conclude the following regarding the impact on the portfolio of HS1 related assets & liabilities under this version of the counterfactual.

Property assets held by LCR - in this case, by 31st March 2013, we assume that the land and property assets would have already been sold off to some other property developer. Therefore they should be excluded from the portfolio under this scenario.

Eurostar & HS1 freehold - for the same reasons as set out above, without HS1, the stake in Eurostar and the HS1 infrastructure would not exist under this version of the counterfactual.

Current assets / liabilities - current assets and liabilities associated with the development of this land may have existed but they would not be on the Government's books. Therefore, we can assume that these items should be excluded under the counterfactual scenario.

Debt - similarly, although it is very likely that long term debt would still have been issued by whichever property developers acquired this land, such debt would not have been transferred to the Government. Consequently, this is irrelevant for our counterfactual scenario

In conclusion, under this version of the counterfactual, there would be no remaining assets or liabilities in Government ownership and therefore the absolute net asset value would be nil.

5.5.4.   Calculation of the incremental value of HS1

Based on the analysis set out above, under either version of the "no HS1" counterfactual scenario, the only element of the portfolio which may remain are the property non-current assets. Therefore, in this section, we consider how to value these assets, assuming that the HS1 project was not pursued. This is necessary for determining the incremental value of HS1 on Government's net assets.

5.5.4.1.   Property assets

We have no way of knowing exactly how the now dormant land would have increased in value without HS1, but we can assume that such an increase can be broken down into two components:

- General London property price increase; and
- Increase due to area specific property price drivers.

We can also assume that under the actual "with HS1" scenario, the value would have increased due to the following factors:

- General London property price increase;
- Increase due to area specific property price drivers; and
- Increase attributable to the introduction of HS1.

As we know the value placed on these assets back in 1996 when they were transferred to LCR from the Government (based on the 1996 CTRL lands agreement), we can project these values forward from 1996 to 2013, assuming that HS1 did not take place.

As a first step in this estimation, we apply average London property price inflation over this period. Figure 5.3 below shows how commercial property prices have changed over the period 1999[51] – 2013.

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[51] Note that the data were not available from 1996 - 1998 which is why this series starts from 1999.

Figure 5.3: Central London Commercial Property Price Index
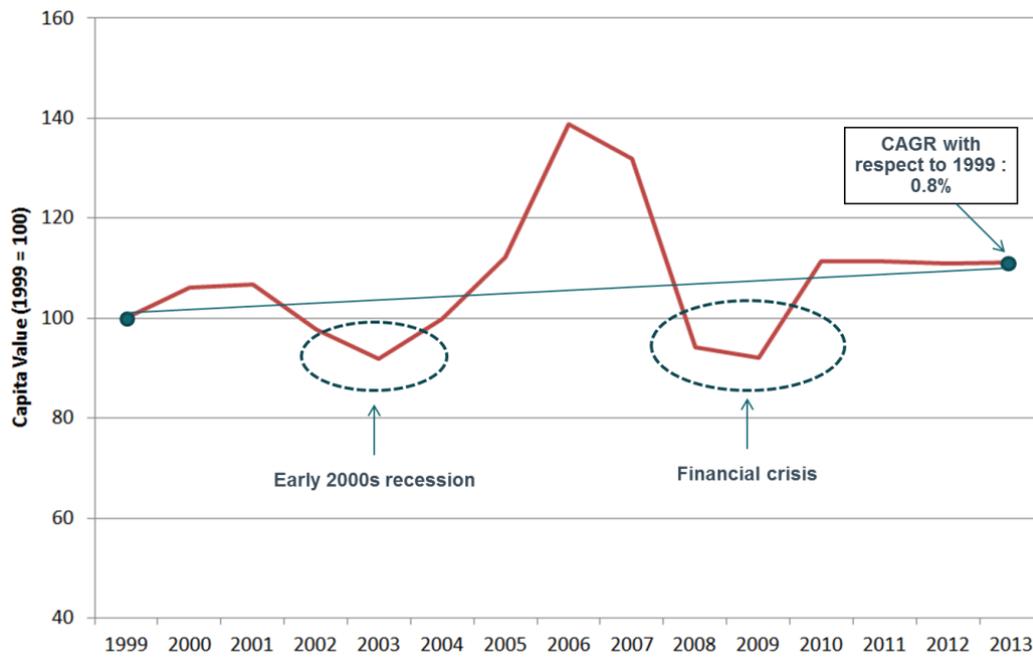
Source: CBRE

Commercial property values in London have increased in absolute terms by 11.2% over the period 1999 to 2013. However, this measurement masks the peaks and troughs of the last economic cycle. For example, the financial crisis destroyed all the value that property had achieved in the first half of the 2000s. The compound average growth rate over this period, which more accurately reflects the average annual movements in prices, is just 0.8%. This is therefore the annual rate we have applied to the 1996 valuations for the land at King's Cross and Stratford for general property price inflation to 2013. Table 5.6 summarises the results of this calculation.

Table 5.6: LCR's Land Revaluation (1996 – 2013)

	Value in 1996 (£m) *(2013 prices)*	Value in 2013 (£m) *(allowing for general property inflation)*
King's Cross	53.8	60.5
St Pancras hotel	-	-
Stratford	28.6	32.6
Total	**82.4**	**93.1**

Source: Frontier analysis

Using these results, we can calculate the differential between the actual absolute value of this land and property, relative to the value it would have had if it had just moved in line with average property values, in the absence of HS1.

On its own though, this information is not enough. In reality, under the counterfactual scenario, the value of the land at King' Cross & Stratford would have changed due to area-specific factors which are also captured in the actual absolute valuations. Trying to isolate the impact of those factors and separate them from the impact of HS1 is not straightforward, due to the concurrent occurrence of several other factors, in particular, the Olympic Games. However, based on our own research and stakeholder interviews, we have estimated the indicative proportion of the gain in value which can be attributed to HS1, rather than other area specific factors.

Below, we consider in turn each of the key property assets included in the Counterfactual 1.

King's Cross & St Pancras hotel

HS1 has played a pivotal role in the growth in value of the land at King's Cross. Although the HS1 project had been in the pipeline for some time and under earlier proposals would have been started much sooner, it was the financial commitment to complete HS1 which really worked as a catalyst for development. King's Cross had also been earmarked as prime development land for several years and would have eventually been developed and hence would have increased in value more than other areas of London. However, without HS1 it would not have been so attractive to property developers and therefore would not have appreciated to the same extent. Based on our research, we therefore estimate that between 80% and 90% of the increase in value that the Government assets in this area have experienced (after allowing for average London property price inflation) can be attributed to HS1, rather than just local factors.

Stratford

Stratford had been considered a prime area for development within the East End for several years before HS1. Good connections with central London were already in place via the Central Line and in the 1990s were improved with the introduction of the DLR and the Jubilee Line Extension. Although HS1 has improved connections with Kent, international services still do not stop at the stations in this area. The Olympics, however, played a major role in the development of the area and from discussions with London Legacy Delivery Corporation and Newham Council, we understand that although HS1 played some part in London winning the games it was just one factor amongst many. Based on our research, we therefore estimate that between 15% and 25% of the increase in value that the Government assets have experienced (after allowing for average London property price inflation) can be attributed to HS1, rather than just local factors.

The differential between our estimates of the current value of these assets and the counterfactual value can therefore be broken down as follows:

- Area specific property price drivers; and

- Price increases attributable to the introduction of HS1.

Using the proportions described above, we can then identify the increase in value which is just attributable to HS1, both under the first and second versions of the counterfactual scenario (i.e. assuming that the Government retained ownership of the dormant land until 2013 and assuming that the Government had sold off the land to the private sector before 2013).

Table 5.7 and Table 5.8 show the results of our assessment of the incremental impact of HS1 on LCR's assets under Counterfactual 1 and Counterfactual 2 respectively.

Table 5.7: Incremental Impact of HS1 on LCR's Land (2013) – Counterfactual 1

	2013			
	Actual (£m)	**Counter-factual (without HS1) (£m)**	**Adj.**	**Differential (£m)**
King's Cross & St Pancras hotel	185.1 – 321.2	60.5	80 – 90%	99.7 – 234.7
Stratford	14.6 - 92.9	32.6	15 – 25%	- 2.7 - 15.1
Total	**199.7 – 414.1**	**93.1**		**97.0 – 249.7**

Source: Frontier analysis

Table 5.8: Incremental Impact of HS1 on LCR's Land (2013) – Counterfactual 2

	2013			
	Actual (£m)	**Counter-factual (without HS1) (£m)**	**Adj.**	**Differential (£m)**
King's Cross & St Pancras hotel	185.1 – 321.2	0	80 – 90%	148.1 – 289.1
Stratford	14.6 - 92.9	0	15 – 25%	2.2 – 23.2
Total	**199.7 – 414.1**	**0**		**150.3 – 312.3**

Source: Frontier analysis

This generates an overall range for the incremental impact of £97.0 to £312.3m. This range is driven by the uncertainty surrounding the valuation of the Stratford development, combined with the uncertainty about whether the Government would have retained or sold the HS1 related land if the HS1 project had not gone ahead.

5.5.5.   Overall impact

Bringing this together with our assumption that none of the other assets or liabilities would remain under the counterfactual; we are able to estimate the overall impact of HS1 by calculating the differential between the actual ("with HS1") and counterfactual ("without HS1") scenarios. As shown in Table 5.9 below, the incremental impact on the value of net assets ranges between -£321.0m and -£106.0m. Consequently, we can say that this is the net liability carried by the Government as a result of the HS1 project.

As noted at the beginning of this chapter, however, we should stress that this result only provides a partial assessment of the HS1 investment. In practice, the Government's financial contribution to HS1 has generated many other benefits in terms of time savings, wider economic impacts and regeneration effects that are captured by the other workstreams of this study.

Finally, we should add that, while the overall result indicates a net financial loss, this is relatively modest with respect to the overall size of the project and its impact.

Table 5.9: Incremental Impact of HS1 on the Full Portfolio of Government-owned Assets & Liabilities (2013)

Asset / liability	Actual (£m)	Counter-factual *(without HS1)* (£m)	Differential (£m)
Non-property assets			
Eurostar International Ltd	323.4	0	323.4
Property assets			
HS1 Ltd freehold	3,377.0	0	3,377.0
LCR's property / land portfolio	*See Table 5.7 and 5.8 for details*		97.0 – 312.3
Total Non-Current Assets	**4,163.5**		**3,797.4 – 4,012.7**
Net current assets			
LCR's current assets	104.8	0	104.8
LCR's current liabilities	- 13.6	0	- 13.6
Total Net Current Assets	**91.2**		**91.2**
Total Assets Less Current Liabilities	**4,254.7**		**3,888.6 – 4,103.9**
Debt			
DfT's debt instruments	(4,209.9)	0	(4,209.9)
Total Net Assets	**44.8**		**(321.0) – (106.0)**

Source: Frontier analysis (see previous sections of report)

5.6. Incremental Impact of HS1 if Financial Restructuring had not occurred

In this section, we consider the specific impact of the financial restructurings of LCR undertaken in 1998 and 2002.

We consider two counterfactual scenarios and how these compare to the actual outturn of events. The first looks at the impact of the first financial restructuring, while the second concentrates on the events associated with the restructuring of 2002.

5.6.1. Impact of the first (1998) financial restructuring

5.6.1.1. Financial restructuring package

The operating performance of Eurostar in the late 1990s was below expectations (we understand that at least in part this was due to the success of the low-cost airlines at this time) and this had a direct impact on LCR's ability to raise all of the private money it needed to build the HS1 link. The Government did not want to materially increase the level of direct grants and therefore LCR entered into negotiations with them regarding its financing. The final agreement in June 1998 involved a significant restructuring.

The construction of HS1 was split into two sections:

- Railtrack was brought in to manage the construction of and purchase section one – this was to be financed by commercial bank borrowing by LCR & guaranteed by Railtrack and bonds issued by LCR covered by a government guarantee;

- Railtrack also took an option to build and buy section one; and

- the Government provided guarantees to enable LCR to raise further financing.

5.6.1.2. Counterfactual scenario

Without this financial restructuring, it seems clear that HS1 would not have been built, as LCR would have been unable to raise the necessary funds privately and therefore would have been unable to proceed without these measures. LCR would have therefore probably entered receivership and the land assets would have been returned to Government. This is analogous to the "no HS1" counterfactual discussed above.

5.6.1.3. Incremental value

As explained, only the land assets would remain within the portfolio and would have only appreciated in line with general London commercial property inflation & due to other area specific factors. This is the same as the "no HS1" counterfactual and therefore the incremental impact of this scenario relative to the actual outcome would be -£321.3m and -£106.0m (see above).

5.6.2. Impact of the second (2002) financial restructuring

5.6.2.1. Financial restructuring package

Although the first stage of the 1998 plan was successful and section one of the construction was completed, Railtrack did not take up the option to build section two. By October 2001, Railtrack had entered administration and was struggling itself. It was therefore decided that LCR would buy back section one from Railtrack and would also become the owner of section two of the HS1 infrastructure. In addition, the Government permitted LCR to structure their existing and new debt such that it was secured against deferred Government grants and the income stream expected from Eurostar for access to section one of the HS1 link.

5.6.2.2. Counterfactual scenario

By this point, part of the HS1 link had already been completed (from the Channel Tunnel to Fawkham Junction in north Kent) and therefore would have remained in operation regardless of the outcome of this second round of restructuring negotiations. If we assume that the Government would not have made the financial guarantees available if the required finance could have been raised without them, then we can assume that without this, the additional private finance would not have been forthcoming and therefore the final section of HS1 (to St Pancras) would not have been completed. Consequently, we can assume that, under this scenario, Eurostar services would have continued to operate out of Waterloo, rather than being moved to St Pancras. We can also assume that as section one of HS1 did not reach Stratford or King's

Cross, there would have been no impact on the value of the land there. We might also assume that this land would have gone back into Government ownership at this stage. Therefore, we can conclude the following regarding the impact on the portfolio of HS1 related assets and liabilities:

- **Property assets held by LCR** - the outcome would be analogous to the "no HS1" counterfactual, i.e. the land would be held by the Government and would only increase in value due to general London commercial property inflation and area specific factors which were unrelated to HS1;

- **Eurostar** – LCR's stake would not have gone back into Government ownership in line with the Government's general rail franchising policy;

- **HS1 freehold** – the value would be reduced to just that of section one;

- **Current assets / liabilities** – to the extent that these are associated with LCR's development of the land at King's Cross & Stratford, we can assume that they would not exist or at least not be on the Government's books; and

- **Debt** – only the debt raised before 2002 (and maturing after 2013) would still exist and we assume that this would still have been taken on by the Government by 2013.

5.6.2.3. Incremental value

Placing a specific quantitative value on the impact of not pursuing the 2002 financial restructuring is not straightforward. Therefore we have outlined the situation from a qualitative perspective.

However, we can calculate the circumstances under which not pursuing the second refinancing would have resulted in a better outcome than pursuing it (i.e. what actually happened).

We know or can reasonably estimate what happened to all of the items in the portfolio under this counterfactual, other than the value of the HS1 freehold. We know that it would be reduced to just the value of section one, but without more detailed information, it would not be possible to put a value on this. However, it is possible to calculate a range for the value of section one of the HS1 infrastructure such that the outcome under this counterfactual exceeds that under the "no HS1" counterfactual and we can then assess whether it seems likely that it would fall within this range.

Table 5.10 below summarises the conclusions of this analysis.

Table 5.10: Incremental Impact of not Pursuing the Second Restructuring of LCR on the Full Portfolio of Government-owned Assets & Liabilities (2013)

Asset / liability	Actual (£m)	Counter-factual *(without HS1)* (£m)	Differential (£m)
Non-property assets			
Eurostar International Ltd	323.4	0	323.4
Property assets			
HS1 Ltd freehold	3,377.0	< 1,522.1	> 1,854.9
LCR's property / land portfolio	*See Table 5.2 and 5.8 for details*		97.0 – 312.3
Total Non-Current Assets	**3,900.1**		**> 2,275.3**
Net current assets			
LCR's current assets	104.8	0	104.8
LCR's current liabilities	- 13.6	0	- 13.6
Total Net Current Assets	**91.2**		**91.2**
Total Assets Less Current Liabilities	**4,254.7**		**> 2,366.5**
Debt			
DfT's debt instruments	(4,209.9)	(1,737.5)	(2,472.4)
Total Net Assets	**44.8**		**> (106.0)**

Source: Frontier analysis (see previous sections of report)

Based on the results presented in the table, we can say that if the value of the HS1 infrastructure had fallen by £1.855bn or more (to £1.522bn or less) under the counterfactual of not pursuing the second refinancing, then this would have resulted in a better outcome than the actual 'with HS1' outcome. At a value of £1.522bn, section one of the HS1 infrastructure represents 45% of the full actual value of sections one and two[52]. We would expect that section two had a greater value than section one, since it delivered a large share of time savings by also enabling the provision of domestic high speed services. Therefore, although we do not know what the value of section one alone would have been under the counterfactual of no second refinancing, it seems likely that it could represent less than 45% of the value of both sections one and two. This implies that choosing not to pursue the second refinancing would have resulted in a higher value for the Government-owned HS1 related net assets than occurred with the second refinancing. However, this would have had a significant negative impact on the benefits generated by the HS1 project in terms of time savings, wider economic impact and regeneration.

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[52] £1,522.1 / £3,377.0 = 45%

5.7. Conclusion

To summarise, we have shown the following.

Absolute value of Government owned HS1 related assets:

- **The absolute value at 31.03.13 of the total non-current assets associated with HS1 is estimated to be within the range £3.9001bn - £4.1145bn.** This includes all of the property assets owned by LCR, which are now ultimately owned by the Government, LCR's 40% stake in Eurostar and the freehold on the HS1 infrastructure; and

- **The absolute value at 31.03.13 of the total net assets associated with HS1 is estimated to be within the range - £218.6m to - £4.2m.** This includes LCR's current assets & current liabilities, but more significantly, the debt originally issued by LCR but subsequently transferred to the DfT. This suggests that the Government is actually holding net liabilities as a result of this project (representing between 0.1% & 6% of the non-current assets).

Incremental impact of HS1:

- The incremental impact of HS1 alone on the net assets of this portfolio of assets and liabilities is estimated to be within the range - £321.0m to - £106.0m. Again, this suggests that relative to a scenario where the HS1 project had not been pursued, the Government incurred incremental net liabilities. However, we note that these are relatively modest with respect to the overall investment and the impact that the project has generated, as described by the other workstreams.

Incremental impact of the two financial restructurings of LCR:

- If the 1998 financial restructuring had not happened, then HS1 would not have been built. This is equivalent to the counterfactual used to calculate the incremental impact of HS1 above. Therefore, we can say that **the 1998 restructuring resulted in a worse outcome with respect to the Government's net financial position than if the Government had let LCR fail, in the range of - £321.0m to -£106.0m**; and

- If the 2002 financial restructuring had not happened, then section two of HS1 would not have been built. Therefore, relative to the actual outcome, **if the value of the remaining freehold on the remaining HS1 infrastructure had fallen by more than £1.8549bn, then the outcome of allowing LCR to fail would have been better than intervening. We expect that this would be a likely outcome. We note, however, that a half-completed HS1 would have not generated the benefits captured by the other workstreams.**

As discussed above, we stress that our conclusions hinge on the following caveats:

- There is a significant level of uncertainty surrounding the property valuations (especially Stratford, due to planning consents not having been obtained on some plots). The net impact range calculated should therefore be seen as indicative rather than a firm estimate;

- There is also some uncertainty surrounding the counterfactual scenario without HS1. It is not clear whether the Government would have retained the land at King's Cross & Stratford in this case or whether, by 2013, they would have sold it to other private property developers. We have considered both options and this also helps to explain why our results are shown as a range;

- The results of this analysis are not incremental to the findings of the other workstreams. They represent a subset of the net impacts, from the specific view point of the Government's balance sheet; and

- While the net impact may be somewhat negative, overall we can conclude that the Government has recovered the majority of the cost it incurred. Moreover, the money invested has generated many other benefits, as identified by the other workstreams, which do not accrue directly to the Government, but to society as a whole.

5.8. Annexes to Section 5

Table 5.11: Details of Absolute Valuation of HS1 related Government owned Assets and Liabilities

Asset / liability	Low (£m)	Mid-point (£m)	High (£m)	Sources (Low / Mid-point / High)
Non-property assets				
Eurostar International Ltd	323.4	323.4	323.4	*LCR's y/e 2013 FS (40% net assets) / - /-*
Property assets				
HS1 Freehold	3,377.1	3,377.1	3,377.1	*DfT's y/e 2013 FS (?) / - / -*
King's Cross Central JV	181	245.8	317	*JLL valuation report for LCR y/e 2013 low MV from sensitivity analysis / mid-point MV / high MV from sensitivity analysis*
King's Cross Northern Lands	2.83	2.83	2.98	*GLH valuation report for LCR y/e 2013 - / mid-point MV / high MV from enhanced scenario analysis*
King's Cross Remainder Plots	160.56	160.56	160.56	*CBRE valuation report for LCR y/e 2013 / - / -*
St. Pancras Chambers*	0.1	0.1	0.1	*LCR Director's valuation for y/e 2013 FS / - /-*
Stratford SCBD	2.2	29.7	69.9	*JLL valuation report for LCR y/e 2013 low MV from sensitivity analysis / mid-point MV / high MV from sensitivity analysis*
Chobham Farm North	7.72	16.9	16.9	*GLH valuation report for LCR y/e 2013 low EUV / mid-point MV / -*
Chobham Farm South	4.6	6.0	6.0	*Deloitte valuation report for LCR y/e 2013 low EUV / mid-point MV / -*
Freehold N24 Stratford Site*	0.05	0.05	0.05	*LCR Director's valuation for y/e 2013 FS / - /-*
Bus layover Stratford*	0.05	0.05	0.05	*LCR Director's valuation for y/e 2013 FS / - /-*
Manchester Depot	1.15	1.15	1.15	*GLH valuation report for LCR y/e 2013 / - / -*
	3,737	3,840	3,952	
Total Non-Current Assets	**4060.7**	**4163.5**	**4275.1**	
Net current assets				
Inventories	3.9	3.9	3.9	*LCR's y/e 2013 FS / - /-*
Trade & other receivables	9.5	9.5	9.5	*LCR's y/e 2013 FS / - /-*
Cash & cash equivalents	91.4	91.4	91.4	*LCR's y/e 2013 FS / - /-*
LCR's trade payables	-13.6	-13.6	-13.6	*LCR's y/e 2013 FS / - /-*
	91	91	91	
Total Assets Less Current Liabilities	**4151.9**	**4254.7**	**4366.3**	
Debt				
£748m Class A1: 5.234% due 2035 (fixed)	-4,209.9	-4,209.9	-4,209.9	*DfT's y/e 2013 FS (carrying value) / - / -*

Asset / liability	Low (£m)	Mid-point (£m)	High (£m)	Sources (Low / Mid-point / High)
£500m Class A2: 2.334% due 2051 (index-linked)				
£1.225bn 4.50% due 2028 (fixed)				
£425m 4.50% due 2038 (fixed)				
£1.1bn. 5.10% due 2051 (fixed)				
Total Net Assets	**-58.0**	**44.84**	**156.39**	

Source: Frontier analysis

5.8.1. Key assumptions underlying professional valuations of LCR's property portfolio

Chobham Farm North (GL Hearn valuation report at 31.03.13) – the valuation assumes that a mixed use scheme based on the planning application submitted in September 2012 goes ahead, after allowing for the amendments which LCR were progressing at the time. An increase in the level of affordable housing across the site has also been introduced which is considered more appropriate by the valuers, based on how receptive the London Legacy Development Corporation had been to the planning applications submitted. In summary:

- 96,208 m^2 (1036 units) of residential accommodation – of which:
  - 10% affordable housing – phase 1; and
  - 15% affordable housing – phase 2-4.
- 33,000 m2 of commercial accommodation.

Chobham Farm South (Deloitte valuation report at 31.03.13) – as there was no defined development plan, based on discussions with the development team, the valuer selected one of three development options which were considered in the 2012 valuation report. This entailed the following:

- Residential with student housing – of which:
  - 25% affordable housing.
- Hotel;
- Sixth form or equivalent education provider; and
- Ancillary retail.

5.8.2. Approach to valuing property non-current assets

5.8.2.1. Joint ventures / associates

LCR applies an equity accounting approach when incorporating its associates into its consolidated accounts (i.e. the carrying value of its investment reflects its share of the entity's net assets). However, it is also includes other adjustments such as deferred profit.

In addition, LCR requests a professional independent valuation report for each of its investments at the financial year-end. Each report sets out the net present value of the forecast future cash flows associated with each property development. These are used for internal management purposes rather than statutory accounting purposes. Normally, they include some sensitivity testing around the central market value estimate.

Prior to the 2013 financial year, DfT considered the professional valuations produced for LCR when determining the "fair value" of these private sector investments in its own accounts. However, in the financial year ending 31st March 2013, it stated that it did not want to rely on independent valuations, due to the high sensitivity of the results to the underlying assumptions. Therefore, it chose to incorporate LCR's share (i.e. % shareholding) of the entity's net assets into its balance sheet, as stated in each of those entities' own financial statements

We have relied on the independent valuations, taking into account the sensitivity analysis and DfT's approach (which avoids the effect of the other adjustments made by LCR) to generate a valuation range for each of the properties.

5.8.2.2. Subsidiaries

LCR consolidates the relevant share of any subsidiary's P&L and balance sheet with its own (i.e. it produces consolidated accounts).

DfT however, in line with Government accounting guidance, does not consolidate the results of any subsidiaries of LCR as "they are to the wider public sector and not to central Government, on the grounds that their trading activities support their operational costs"[53].

LCR only has one subsidiary (which holds the St Pancras Chambers hotel) which we have decided to incorporate in our analysis as the Government is still the ultimate parent of this company.

5.8.2.3. All other investment property (directly owned by LCR)

In the case of the most material remaining investment properties, LCR requests a professional independent valuation report for each one at the financial year-end. These are used to value the properties in the financial statements.

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[53] See Note 1.3.1, Department for Transport, Annual Report and Accounts 2012–13

6. Cost Effectiveness

6.1. Introduction

This chapter provides an overview of the estimated costs to government of HS1 and domestic HS services and compares them with the monetary value of the impacts of the line and services, as estimated in previous chapters, to provide an indication of the cost effectiveness of the scheme over the appraisal period to 2069[54].

The chapter consists of four further sections, which summarise:

- the costs to government of the implementation of HS1;
- the costs to government and Southeastern of operating the domestic HS services and net cost to Eurostar of HS1 access charges;
- the comparison of monetised benefits and costs, including the results of sensitivity tests to vary the values of key assumptions; and
- key concluding points.

6.2. Implementation cost to the public sector

The estimated costs to the public sector of the implementation and operation of HS1 and domestic HS services have largely been taken directly from the 2012 National Audit Office report[55], which provides a comprehensive view of the subject.

The largest component of the costs is the original construction for which NAO estimate total outturn costs to have been £6.2bn as summarised in Table 6.1 below.

Table 6.1: Outturn Cost of Constructing the High Speed Line – NAO Estimate

Origin	Section 1 (£m)	Section 2 (£m)	Whole line (£m)
Construction cost	1,761	3,541	5,302
Total contract cost[56]	**1,919**	**3,778**	**5,697**
Station fit-out [57]			**109**
New depot[58]			**357**
Total cost of building high speed line			**6,163**

Source: The completion and sale of High Speed 1, NAO, 2012: Figure 3[59]

However, Appendix 4 of the NAO report[60] notes that these costs do not include the remodelling of the London Underground station at King's Cross St Pancras, saying that whilst the work was undertaken partially to cater for additional passengers travelling to St Pancras from HS1, there were a number of contributing factors and they were unable to apportion costs attributable to HS1.

The costs of the station remodelling were significant, with outturn costs at the end of 2011/12 of over £880m[61]. The upgrade required to increase station capacity to cater for ongoing passenger growth in the absence of HS1 would have been considerably smaller, only equivalent to a proportion of Phase 1 of the works undertaken with HS1 which had an outturn cost of £420m. Therefore the additional costs incurred as a result of HS1 are substantial.

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[54] The basis for the appraisal period is set out in Chapter 2.
[55] The completion and sale of High Speed 1, National Audit Office, March 2012.
[56] The total contract cost includes Union Railway costs, property costs and income, as well as construction costs which include payments to RLE for project design and management.
[57] Passenger and retail facilities at St Pancras, Stratford frond Ebbsfleet International stations funded by LCR.
[58] Separately funded by the Department, including £16m for land purchase.
[59] Sources cited in NAO document as Figure 6 in Progress on the Channel Tunnel Rail Link, Session 2005-06, HC 77, restated to remove rounding as well as NAO analysis of LCR and departmental data.
[60] The Completion and Sale of High Speed 1, NAO, 2012, Appendix 4, Cost Benefit Analysis.
[61] Cost details provided by DfT.

The NAO estimate of the public sector costs of HS1 has therefore been adjusted to include the cost of the station remodelling at King's Cross St Pancras, reduced to account for the cost of the more minor upgrade to the station that would have been required in the counterfactual, in the absence of HS1. It has been assumed that the counterfactual scheme would have involved works costing the equivalent of 50% of Phase 1 of the HS1 works (on the basis of advice from Transport for London), i.e. £210m in outturn costs. This adjustment is shown in the last lines of Table 6.2 below:

Table 6.2: Outturn Cost of Constructing the High Speed Line – NAO estimate + King's Cross St Pancras Remodelling

Origin	Section 1 (£m)	Section 2 (£m)	Whole line (£m)
Construction cost	1,761	3,541	5,302
Total contract cost[62]	**1,919**	**3,778**	**5,697**
Station fit-out [63]			**109**
New depot[64]			**357**
Total cost of building high speed line (NAO)			**6,163**
Total cost of King's Cross St Pancras underground remodelling with HS1			885
Saving of costs of King's Cross St Pancras remodelling required without HS1			-210
Total cost of building high speed line including King's Cross St Pancras			**6,838**

Source: The completion and sale of High Speed 1, NAO, 2012: Figure 3[65] and information on Phase 1 and 2 HS1 King's Cross St Pancras underground remodelling costs from DfT and advice from LUL on approximate relative cost of scheme required without HS1

The other key elements of cost cited by the NAO were costs incurred by the Department for Transport during the restructuring and sale of HS1 Ltd, totalling approximately £600m as summarised in Table 6.3 below.

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[62] The total contract cost includes Union Railway costs, property costs and income, as well as construction costs which include payments to RLE for project design and management.
[63] Passenger and retail facilities at St Pancras, Stratford and Ebbsfleet International stations funded by LCR.
[64] Separately funded by the Department, including £16m for land purchase.
[65] Sources cited in NAO document as Figure 6 in Progress on the Channel Tunnel Rail Link, Session 2005-06, HC 77, restated to remove rounding as well as NAO analysis of LCR and departmental data.

Table 6.3: **Costs Incurred by the Department during the Restructuring and Sale**[66]

Item	Amount (£m)
Eurostar Support	
Prepayment of existing rolling stock leases	177
Recapitalisation - investment in Eurostar	40
Subtotal	**217**
Costs associated with restructuring and sale	
Buy out of Network Rail (CTRL) Limited contract to maintain the high speed line[67]	109
Budgetary support to LCR	100
Assumption of lease payments for Ashford International station	65
Eurostar UK pension deficit	59
Transition elements of access charges	50
Subtotal	**383**
Total costs[68]	**600**

Source: The completion and sale of High Speed 1, NAO, 2012: Figure 5

Other contributors to the net impact on government cited by the NAO include the write-off of the £110m loan made in 1998 during the restructuring of LCR and the benefit of the income received from the sale of the HS1 concession.

This sums to net government support for the project of £8.8bn (if the remodelling of King's Cross St Pancras is included), as summarised in Table 6.4 below. The construction costs presented in Table 6.2 account for three quarters of this total and contribute to the grants and capacity payments and present value of project debt interest and repayments entries in the table, as well as the King's Cross St Pancras entry. The costs detailed in Table 6.3 are summarised in the restructuring and sale support entry.

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[66] Incurred costs are given in outturn prices and occurred in 2009 and 2010.
[67] The payment may result in a reduction in funding to Network Rail from the Department in the next control period (starting in 2014)).
[68] The NAO report also cites advisers' fees of £60m spent on financial, legal and technical advice to support the restructuring and sale. However, in correspondence with the NAO for this study they have stated that these were excluded from the overall assessment as the costs were partly associated with advice on European legislation and it was not possible to separate them out.

Table 6.4: Net Government Support for Implementation of HS1[69]

Incurred support	Outturn Cost (£'000s)
Grants and capacity payments	3,668
Restructuring and sale support (as detailed in Table 6.3)	600
Loan write-off	110
Net income from concession sale[70]	-1,016
Net cost of King's Cross St Pancras underground remodelling	675
Total support costs incurred to date (outturn prices)	**4,037**
Future support (present value, 2010 prices)	
Present value of project debt interest and repayments	4,800
Net government support (NAO estimate adjusted for estimated King's Cross St Pancras remodelling)	**8,837**

Source: The completion and sale of High Speed 1, NAO, 2012: Figure 9 and information on Phase 1 MRSSL HS1 King's Cross St Pancras costs from DfT and advice from LUL on approximate relative cost of the scheme required without HS1

6.3. Domestic HS Operating Costs and Eurostar HS1 Access Charges

6.3.1. Domestic operating cost model estimates

Table 6.5 below sets out the operating costs for 2012/13 estimated using an operating cost spreadsheet model developed for the study. Annual costs amount to £240m (2013 prices). Table 6.6 then provides the unit cost rate used in the cost estimates for key items, derived on the basis of expert knowledge of the rail industry and a variety of sources including timetable details, DfT data, the HS1 Network Statement for infrastructure and electricity charges related to HS1 itself, Network Rail tariff lists for equivalent information for the element of the journeys on classic rail, ATOC maintenance costs and job advertisements and appropriate uplifts for overheads for staffing costs.

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[70] This figure refers to the net income received from the original sale of the concession. The overall calculation of cost effectiveness below includes an additional allowance of £700,000 (NPV, 2010 prices) for the resale of the concession in 2040.

Table 6.5: Annual Operating Costs by Component (£m, 2013 resource prices)

Item	Amount (£m)
Leasing Cost	£41.8
Staff Costs	£13.5
HS1 Station Access Charges[71]	£11.1
HS1 Track Access Charge (OMRC and IRC)[72]	£152.1
HS1 Depot Access Charges[73]	£0.5
HS1 Traction Energy	£5.1
Carbon Costs	£0.0
Network Rail Fixed Track Access Charge	£6.2
Network Rail Variable Track Access Charge	£0.9
Network Rail Capacity Charge	£0.2
Network Rail Electric Asset Usage Charge	£1.3
Network Rail Traction Energy	£4.0
Ashford Station Annual Long Term Charge	£0.0
Total	£238.4

Table 6.6: Unit Operating Costs by Component (2013 resource prices)

Item	Amount (£)
Per Unit Monthly (Dry) Leasing Costs	£55,000
Staff Costs (per driver)	£71,595
Staff Costs (per conductor)	£46,099
HS1 Station Access Charge: St Pancras	£5,307,482
HS1 Station Access Charge: Ebbsfleet	£2,372,359
HS1 Station Access Charge: Stratford	£3,515,784
HS1 Depot Access Charge	£442,453
HS1 Track Access Charge, Investment Recovery Charge (per train min)[74]	£83
HS1 Track Access Charge: Operations, Maintenance and Renewal Charge (per train min)	£44
Network Rail Fixed Track Access Charge (per train mile)	£3.52
Network Rail Variable Track Access Charge (per 6 car train mile)	£0.51
Network Rail Capacity Charge (Margate/Dover) per train mile	£0.09
Network Rail Capacity Charge (Faversham/Maidstone West) per train mile	£0.12
Network Rail Electric Asset Usage Charge (per train mile)	£0.73
Electricity Costs (p/kWh)	£0.08
Ashford Station Annual Long Term Charge	£226,154

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[71] For St Pancras, Ebbsfleet and Stratford, figures provided by DfT, average of 2012/13 and 2013/14 in 2013 prices
[72] Figure provided by DfT, average of 2012/13 and 2013/14 in 2013 prices
[73] For St Pancras, Ebbsfleet and Stratford, figures provided by DfT, average of 2012/13 and 2013/14 in 2013 prices
[74] This is the full quoted IRC, however the HS1 Asset Management Statement states that discounts are potentially available for this element of charge to improve commercial viability of certain services, however detail on the application and scale of discounts is commercially sensitive and not publicly available

It is recognised that the changes in service associated with HS1 will also have affected operating costs for other Southeastern services, as a result of the changes introduced in the restructuring of the timetable to coincide with the start of HS services. However, as outlined in Chapter 2, the extent and complexity of the changes made at that time have led both DfT and Southeastern to identify that it is not possible to separate out the components of the change that can be considered directly attributable to HS1.

The changes are likely to have caused cost increases in some areas and decreases in others, leading to net changes that will have been small in scale in comparison to the costs of the new HS services. It has therefore been agreed that it is appropriate to exclude these impacts from the assessment.Apart from the long term lease cost for Ashford and station access charges for HS1 stations, station costs have also been excluded from the estimates above as, for the classic rail stations served by the HS services, it is not possible to disaggregate HS related costs from other station costs.

In estimating future year operating costs from the model, in the absence of confirmed plans for future changes, it has been assumed that HS services remain unchanged over the appraisal period, as discussed in Chapter 2. Annual costs have therefore been assumed to remain largely unchanged in real terms with most components growing in line with standard inflation only. The only exceptions are the HS1 TAC (discussed further below), electricity charges which are assumed to grow in line with the central industrial electricity price forecast set out in the government's Interdepartmental Analysts Group (IAG) energy and climate change appraisal toolkit[75] and staff costs which are assumed to grow in line with forecast average earnings as set out in the Office for Budget Responsibility's Economic and Fiscal Outlook[76].

The total value of operating costs over the appraisal period to 2069 is forecast to be £11bn (PV, 2010 prices and values, market prices, including HS1 TAC and SAC).

6.3.2. Government support

The original renegotiation of the franchise agreement with Southeastern undertaken to accommodate the operation of domestic HS services in 2009 (covering the period until the end of 2014) was based on a financial model which included an allowance for the Track Access Charges (TAC) and Station Access Charges (SAC) associated with the use of the HS1 infrastructure. However, due to the levels of uncertainty surrounding future charging levels associated with HS1, it was contractually agreed that the Department for Transport would pay to cover any variation in the access charges from the allowance made in the model.

To put this arrangement into effect for the franchise period, Southeastern have paid the original TAC allowance allocated in the financial model to the DfT (in the form of an increase to the agreed franchise premium) and DfT have reimbursed Southeastern the (significantly larger) actual cost of the HS1 TAC.

A separate reconciliation payment has also been in place for the HS1 SAC, representing the difference between the charge assumed in the financial model and that actually charged by HS1.

DfT data shows that the net cost to DfT in recent years has been approximately £116m, resulting from the total TAC of £153m offset by an uplift to Southeastern's premium of £36m to cover the original TAC allowance in the financial model[77] (all in 2012/13 prices) and a payment of £1m to cover a reduction in the SAC relative to the allowance in the financial model.

This DfT TAC payment has been distinct from any revenue subsidy provided to Southeastern (to compensate for shortfall in revenue receipts relative to the levels anticipated at franchise award)[78]. Revenue subsidy is calculated as a single figure for each operator and it is therefore not available at a disaggregate level by service, meaning that it is not possible to identify any revenue support attributable directly to HS

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[75] https://www.gov.uk/government/policies/using-evidence-and-analysis-to-inform-energy-and-climate-change-policies/supporting-pages/policy-appraisal

[76] Economic and Fiscal Outlook, March 2014, Office for Budget Responsibility. http://budgetresponsibility.org.uk/economic-fiscal-outlook-march-2014/. The report provides forecast growth rates to 2018. The average of the 2014 to 2018 rates provided were assumed to apply until 2033 after which point wages were assumed to grow in line with standard inflation

[77] Based on data provided by DfT, assumed to exclude VAT

[78] The NAO cost benefit analysis (Table 13, The Completion and Sale of High Speed 1, NAO, 2012) includes an entry for this DfT payment, assuming that the 2010/11 payment of £108m is continued annually throughout the 60 year appraisal period. The report notes that there is considerable uncertainty around the figure, as it is dependent on negotiations between DfT and future operators as discussed above. However, it is also noted that the figure is dependent on movements in operator costs and revenues and would reduce if revenue grew at a faster rate than costs. Conversations with the DfT in relation to this study have suggested that this is not a direct link. The payment is directly to cover the HS1 TAC and SAC and is therefore independent of any changes in revenue and other costs.

services. It has therefore been agreed that, for the purposes of this assessment, the revenue support for the original franchise period (2009 to the end of 2014) should be considered to be the difference between forecast operating costs (net of the DfT contribution to TACs) and forecast revenue.

The franchise agreement for the period 2015 to 2018 was finalised during 2014. This revised the arrangements for the payment of HS1 access charges as the new financial model included charges in keeping with those actually incurred between 2009 and 2014 (rather than the much lower figures in the original financial model).

Under the new arrangements, Southeastern will be responsible for payment of the SAC and TAC to HS1 but the schedule of franchise payments between DfT and Southeastern takes their scale into account (and would be adjusted if there was a significant change in the charges).

The net effect for DfT of domestic HS service operation therefore remains largely unchanged. Where the costs of operating domestic HS1 services exceed net forecast revenue generated (the situation forecast throughout the appraisal period), the DfT will ultimately bear the cost of the difference.

In the first franchise period this cost has taken the form of the TAC payments and increased revenue support to Southeastern as a whole. In the next franchise period it will take the form of increased franchise payments to Southeastern and/or reduced franchise payments from Southeastern as profit made from other Southeastern services is used to offset the costs of operating domestic HS services rather than being paid to the DfT through the franchise payment mechanisms (as assumed in the counterfactual, without HS1 scenario).

For the purposes of the appraisal it has been assumed that arrangements equivalent to those agreed for the next franchise period will remain in place throughout the appraisal period.

The annual DfT support for domestic HS services is significant and adds considerably to the public sector cost of HS1. However it is subject to some uncertainty as it depends on future levels of HS1 TAC and SAC and on negotiations when the new concession is let in 2040.

The current TAC is split between an Investment Recovery Charge (IRC, approximately two-thirds of the total) and an Operations, Maintenance and Renewal Charge (OMRC, approximately one-third of the total). Current evidence suggests that the OMRC element is likely to decrease through time. The HS1 Asset Management Statement for Control Period 2[79] (CP2, starting in 2015), recently approved in the Office for Rail Regulation's Periodic Review[80], includes a statement of intention to reduce the OMRC element of the TAC by 13% relative to CP1 in CP2 (equivalent to a 5% reduction in total TAC) as a result of improvements in efficiency, understanding and methods.

It seems likely that similar improvements will be possible over the subsequent Control Periods, leading to further reductions in the OMRC. However the IRC has been fixed for the life of the current concession (to 2040). The rate would be likely to change as part of the setup of the new concession at that stage. However, in the absence of any information on the form that the change might take, it has been assumed that the IRC and SAC will remain consistent throughout the life of the 60 year appraisal.

6.3.3.   Eurostar HS1 access charges

The access charges incurred by Eurostar for running services on the HS1 infrastructure are considerably higher than the equivalent charges previously incurred for running the services on the Network Rail infrastructure.

As data availability for Eurostar is very limited due to commercial considerations, estimates of the net additional access charges have been made from publicly available information in HS1's May 2014 Network Strategy[81] and Five Year Asset Management Statement[82],Network Rail's CP5 charges (for the counterfactual, without HS1 scenario) and Eurostar timetables.

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[79] Five Year Asset Management Statement, Consultation, HS1 Ltd, 18 October 2013
http://www.highspeed1.com/media/16154/hs1_ltd_5yams_consultation_18_october_2013_public.pdf
[80] 2014 HS1 Periodic Review (PR14): ORR's Approval of HS1 Ltd's Five Year Asset Management Statement, ORR, May 2014
http://orr.gov.uk/__data/assets/pdf_file/0006/12102/hs1-periodic-review-2014-approval.pdf
[81] http://highspeed1.co.uk/media/1858/hs1_network_statement__may_2014_.pdf
[82] http://highspeed1.co.uk/media/1915/hs1-ltd-five-year-asset-management-statement.pdf

Table 6.7 summarises the estimated annual costs for 2013, disaggregated by IRC and OMRC.

Table 6.7: Eurostar Estimated Annual Access Charges (2013 resource prices)

Item	Amount (£ mill)
HS1: IRC (1)	£41
HS1: OMRC (2)	£35
Counterfactual scenario (without HS1) (Network Rail charges) (3)	£5
Net impact of HS1 *(4) = (1) + (2) – (3)*	£71

For the purposes of the appraisal the following changes through time have been assumed:

- IRC is forecast to increase in 2017 when the current discount offered for Brussels services is expected to end, and
- In keeping with the assumption for domestic services, OMRC is forecast to decrease by 13% at the start of each control period until (and including) CP5, in line with the recently announced reduction for CP2, reflecting efficiency improvements.

It is noted that the net additional access charges for Eurostar services incurred before 2009 built up as intra-company debts within LCR and therefore are assumed to be included in the project debts and costs taken on by the DfT during the restructure of LCR in 2009. The allowance for the net annual increase in access charges for Eurostar services in the appraisal therefore only accounts for the years between mid 2009 and the end of the appraisal period in 2069.

Other operators (such as DB Schenker) have stated plans to operate services using HS1 and the Channel Tunnel. However details such as start date, routes and timetable remain uncertain. Therefore, in keeping with the assumption for domestic services, in the absence of committed plans for additional services, it has been assumed that service levels remain at current levels throughout the appraisal period.

The total estimated value of additional access charges over the appraisal period from 2009 to 2069 is forecast to be £2bn (PV, 2010 prices and values, market prices).

In the context of the lack of available data it has been assumed that the net impact of HS1 on all other elements of Eurostar operating costs (such as staff costs) was negligible as the number of services run remained unchanged by the implementation of HS1.

6.3.4. Sensitivity tests

The uncertainty surrounding the scale of the ongoing HS1 access charges and associated DfT support for domestic HS services has been captured in the cost effectiveness analysis below through a 'central' case and two sensitivity tests:

- Central case: using the DfT data on TAC/SAC payments and assuming that the proposed 13% decrease in OMRC feeds directly to the DfT, reducing their support for services in CP2. An equivalent proportional reduction is then assumed for CP3, CP4 and CP5 (to 2035[83]) with payments remaining fixed in real terms for the remainder of the appraisal period[84]. Eurostar is also assumed to benefit from reduced OMRC in CP2 to CP5.

- Sensitivity tests (applied to both domestic HS1 and Eurostar costs):
    - assuming the OMRC remains at CP1 levels throughout the appraisal period; and
    - assuming a 26% reduction in OMRC in each consecutive control period from CP2 to CP5.

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[83] This cut off point was selected as it ties in well with the point (in 2033) at which demand and real growth in fares are assumed to be capped
[84] Also assuming that the indexing of RPI+1.1% applied in CP1 is stopped in CP2, in line with commentary in the HS1 Asset Management Statement for Control Period 2

6.4. Cost Effectiveness

6.4.1. Central Case and Individual Sensitivity Tests

Table 6.8 to Table 6.10 below summarise the estimated costs and benefits associated with the implementation of HS1 and associated timetable changes over the appraisal period to 2069, in a manner consistent with WebTAG economic appraisals.

Table 6.8 is a Transport Economic Efficiency table showing the impact of the implementation of HS1 and associated services on transport users and private sector providers (i.e. Southeastern and Eurostar)[85]

Table 6.9 then provides a Public Accounts table to summarise the impact on the public sector and Table 6.10 is the AMCB table, a summary analysis of monetised costs and benefits to summarise overall impacts. The final rows of this table show summary indicators of cost effectiveness in terms of the Net Present Value (NPV) of impacts (PVB-PVC) and Benefit Cost Ratio (BCR) for the public sector investment, calculated in line with WebTAG guidance.

All figures are present values over the appraisal period to 2069, in 2010 market prices and values.

The left hand column of figures in each table provides a 'Central' scenario which assumes that:

- 50% of indirect domestic time savings can be considered attributable to HS1;

- PDFH based domestic demand growth and international demand growth occurs until 2033, in line with WebTAG recommendations;

- the balance between business, commuting and other purposes on the trips affected by HS1 is in line with the proportions of tickets of different types sold and the PDFH assumptions on the proportions of passengers buying each ticket type that travel for different purposes;

- January 2014 WebTAG values of time apply; and

- a 13% reduction in the OMRC element of the HS1 TAC occurs in CP2 with equivalent proportional reductions in CP3, CP4 and CP5.

All subsequent columns in the table provide equivalent information, calculated for a sensitivity test varying one of the assumptions identified above (as specified in the column header). The tests cover influences on both benefits (in line with the tests presented in Chapter 2) and costs (considering the impacts of the TAC sensitivity tests outlined).

Two sets of PVBs, NPVs and BCRs are shown for each test. The first includes only the user and operator impacts considered in Chapter 2 along with the costs from this Chapter. The second set also includes the monetary value of Wider Economic Impacts (WEI)[86], as set out in Chapter 3.

The figures show that the estimated BCR of HS1 (and associated services) varies between 0.43 and 0.65 across the various sensitivity tests if Wider Economic Impacts are excluded from the analysis and between 0.52 and 0.77 if they are included.

The 'Central' case BCRs are 0.53 without WEI and 0.64 with WEI, suggesting that the monetised benefits of the scheme do not fully cover the costs over the appraisal period, with the PVC of £12.60bn and PVB of £6.70bn (without WEI) or £8.03bn (with WEI) generating a NPV of -£5.90bn (without WEI) or -£4.57bn (including WEI). However, the range of results across the tests suggests that cost effectiveness is sensitive to a range of issues.

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[85] HS1 Ltd and Network Rail are not explicitly included as it is assumed that the access charges paid to the companies (represented as costs to Eurostar and Southeastern) are a fair representation of the costs of maintaining, operating and investing in the HS1 and classic rail network respectively

[86] The changes in Wider Economic Impacts between sensitivity tests reflect changes due to variations in the estimate of increased output in imperfectly competitive markets as these impacts are linked directly to the scale of business user benefits estimated. Agglomeration and labour market effects have been assumed to remain unchanged between sensitivity tests as the relationship between benefit size and the variables tested is less direct.

The values of time assumed (and the associated issue of purpose split) are also significant. The use of the previous (pre January 2014) WebTAG values increases the value of user time savings to the extent that the BCR increases to 0.62 (or 0.74 with WEI).

The tests of reduced demand growth lead to a marked reduction in the scale of user benefits and revenue and therefore reduce the BCR to 0.46/0.47 without WEI or 0.56/0.57 with WEI. Conversely increasing or extending demand growth considerably increases user benefits and revenues, increasing the BCR to up to 0.65 (or 0.77 with WEI) for the test of increased growth rate.

Varying the assumption made on the proportion of domestic passengers using HS services assumed to be new to rail causes the BCR to vary from 0.49 to 0.57 (without WEI) or (0.60 to 0.68 (with WEI). The BCR increases as the proportion assumed to be new to rail decreases, because those who would travel by rail in the counterfactual are assumed to experience the full change in journey costs associated with HS services whereas those transferring to rail are assumed to experience half (in line with the 'rule of half' approach to economic assessment).

Different assumptions on the proportion of indirect impacts for non HS Southeastern passengers (which occur due to timetable changes implemented simultaneously to the introduction of HS1) to consider directly attributable to HS1 cause the BCR to vary between 0.51 and 0.55 (without WEI) or 0.61 to 0.66 (with WEI) for the scenarios where 0% and 100% of indirect benefits are attributed to HS1 respectively.

Assuming that fares will grow directly in line with RPI rather than RPI + 1% causes only a slight reduction in the BCR due to the offsetting effects of revenue loss and reductions in user charge disbenefits and loss of indirect taxation to government. Without WEI the BCR remains at 0.53 and with WEI it reduces slightly to 0.63.

Finally, the assumption made on the level of reduction of the OMRC payment through time causes the BCR to vary by approximately 0.03 in each direction; from 0.50 (or 0.60 with WEI) for the High payment test to 0.56 (or 0.67 with WEI) for the Low payment test.

6.4.2. Combined Sensitivity Tests

The impacts of several of the tests (apart from the different growth tests) could be considered to be additive. Therefore combining several of the variables with positive impacts on BCR would lead to a significant increase in BCR and similarly the combination of a number of downside assumptions would considerably reduce the estimated BCR.

The appraisal (i.e. future forecasting) element of the assessment includes areas of considerable uncertainty. Therefore, given the sensitivities illustrated above, it is possible to envisage a number of changes relative to the current assumptions that would lead to a marked increase in BCR. Illustrative changes that would achieve a BCR of 1 include avoiding the need for ongoing DfT subsidy for HS domestic services, a 50% increase in the value of domestic and international user benefits and revenue over the appraisal period or an increase in the proportion of passengers that are travelling for business or other purposes with high values of time to about 75% (from the current 20% to 22%).

Additionally, the sensitivity tests identified are not mutually exclusive and it is possible to envisage future scenarios in which several of the identified changes in forecast variables with either a positive or negative impact on the economic case for HS1 occur simultaneously, with larger cumulative impacts on the BCR than those identified in the table above for individual tests.

For instance, considering the variables assessed in the sensitivity tests, it would be possible to envisage a high demand growth scenario in which HS services particularly attracted business travellers (or others with high values of time). As an illustration, if this led to demand growth of 200% of the central case, continuing to 2043, with business passengers accounting for 150% of the central proportion, it would lead to an estimated BCR of the order of 1.2 (with WEI).

Conversely, a low growth scenario in which HS services were particularly attractive to non business travellers could lead to a BCR of the order of 0.4 with WEI (if growth was 50% of the central case stopping in 2023, with business passengers accounting for 50% of the central proportion).

Table 6.11 provides the summary AMCB for these illustrative combined sensitivity tests.

The results suggest an illustrative range of 0.4 to 1.2 for the BCR (with WEI) for the combined tests. However, it is important to note that these values represent an illustration of the cumulative impacts of a combination of pessimistic or optimistic assumptions in relation to future scenarios. They do not reflect minimum and maximum possible values of the BCR, as the individual sensitivity tests were defined to represent a plausible range of values to illustrate the relative sensitivities of the economic case to key identified variables, rather than representing maximum and minimum feasible values. However, the size of the range highlights the importance of the assumptions made in relation to certain key future variables, particularly when possible variations are considered cumulatively.

Table 6.8: Summary of Transport Economic Efficiency (TEE) Impacts (PV for appraisal period 2003-2069, £m 2010 prices/values, positive numbers are benefits)

Impact	Central	Indirect time savings		Demand growth					Journey purpose split		VOT	'New to rail 'trips		Fares growth	Sensitivity Tests for Costs – DfT HS1 TAC/SAC Payment	
		0%	100%	2023 growth cap	2043 growth cap	50% annual growth	150% annual growth	150%/200% annual growth[87]	50% default business %age	150% default business %age	Previous WebTAG value of time	50% central	150% central	RPI +0%	Low	High
User benefits																
International Rail Time Savings	2,985	2,985	2,985	2,840	3,120	2,800	3,185	3,405	2,260	3,710	3,735	2,985	2,985	2,985	2,985	2,985
Domestic Rail Time Savings	1,680	1,410	1,925	1,420	1,865	1,380	2,055	2,055	1,350	2,010	1,990	1,790	1,570	1,680	1,680	1,680
Domestic Rail User Charge Impacts	-580	-580	-575	-460	-660	-495	-680	-680	-570	-585	-580	-610	-550	-500	-580	-580
Road User Impacts: Decongestion Benefits	870	825	885	715	905	710	1,075	1,075	870	870	870	435	1,310	870	870	870
Private sector provider impacts																
Revenue																
International	4,160	4,160	4,160	4,005	4,280	3,955	4,385	4,665	4,160	4,160	4,160	4,160	4,160	4,160	4,160	4,160
Domestic	1,730	1,730	1,730	1,365	1,930	1,465	2,055	2,055	1,730	1,730	1,730	1,235	2,225	1,490	1,730	1,730
Operating Cost																
International	-2,110	-2,110	-2,110	-2,110	-2,110	-2,110	-2,110	-2,110	-2,110	-2,110	-2,110	-2,110	-2,110	-2,110	-1,935	-2,280
Domestic net of subsidy [88]	-1,730	-1,730	-1,730	-1,365	-1,930	-1,465	-2,055	-2,055	-1,730	-1,730	-1,730	-1,235	-2,225	-1,490	-1,730	-1,730
PV of TEE Benefits	7,005	6,690	7,270	6,410	7,400	6,240	7,910	8,410	5,960	8,055	8,065	6,650	7,365	7,085	7,180	6,835

Table 6.9: Summary of Public Accounts (PA) Impacts   (PV for appraisal period 2003-2069, £m 2010 prices/values, positive numbers are benefits)

Impact	Central	Indirect time savings		Demand growth					Journey purpose split		VOT	'New to rail 'trips		Fares growth	DfT HS1 TAC/SAC Payment		
															Sensitivity Tests for Costs		
		0%	100%	2023 growth cap	2043 growth cap	50% annual growth	150% annual growth	150%/ 200% annual growth[87]	50% default business %age	150% default business %age	Previous WebTAG value of time	50% central	150% central	RPI +0%	Low	High	
Government funding: Transport																		
Capital grants, guarantees, restructuring & other support & future debt liability[88]	9,915	9,915	9,915	9,915	9,915	9,915	9,915	9,915	9,915	9,915	9,915	9,915	9,915	9,915	9,915	9,915	2
Net concession sales proceeds	-1,700	-1,700	-1,700	-1,700	-1,700	-1,700	-1,700	-1,700	-1,700	-1,700	-1,700	-1,700	-1,700	-1,700	-1,700	-1,700	3
DfT support subsidy/lost revenue	4,380	4,380	4,380	4,745	4,180	4,645	4,055	4,055	4,380	4,380	4,380	4,875	3,885	4,620	4,065	4,830	4
Government funding: Non-transport																		
Indirect Tax Revenues	825	755	785	745	865	750	910	945	1,015	720	825	710	940	790	825	825	5
Totals																		
Broad Transport Budget	12,595	12,595	12,595	12,960	12,395	12,860	12,270	12,270	12,595	12,595	12,595	13,090	12,100	12,835	12,280	13,045	6 = 2+3+4
Wider Public Finances	825	755	785	745	865	750	910	945	1,015	720	825	710	940	790	825	825	7 = 5

(PV for appraisal period 2003-2069, £ mill, 2010 prices/values, positive numbers are benefits)

Table 6.10: Analysis of Monetised Costs and Benefits (AMCB)

Impact	Central	Indirect time savings		Demand growth					Journey purpose split		VOT	'New to rail 'trips		Fares growth	TAC OMRC Payment		
		0%	100%	2023 growth cap	2043 growth cap	50% annual growth	150% annual growth	150%/200% annual growth[87]	50% default business %age	150% default business %age	Previous WebTAG value of time	50% central	150% central	RPI +0%	Low	High	
Noise/local air quality	10	5	10	10	10	10	10	0	10	10	10	5	15	10	10	10	
Greenhouse gases	35	35	35	30	35	30	40	0	35	35	35	15	50	35	35	35	
Crowding, reliability, punctuality & quality	475	450	450	405	520	395	570	570	395	525	540	505	445	475	475	475	
User benefits	4,955	4,640	5,220	4,515	5,230	4,395	5,635	5,855	3,910	6,005	6,015	4,600	5,315	5,035	4,955	4,955	
Provider impacts	2,050	2,050	2,050	1,895	2,170	1,845	2,275	2,555	2,050	2,050	2,050	2,050	2,050	2,050	2,225	1,880	
Wider Public Finances (ind. tax)	-825	-755	-785	-745	-865	-750	-910	-945	-1,015	-720	-825	-710	-940	-790	-825	-825	
PVB	6,700	6,425	6,980	6,110	7,100	5,925	7,620	8,035	5,385	7,905	7,825	6,465	6,935	6,815	6,875	6,530	
PVC	12,595	12,595	12,595	12,960	12,395	12,860	12,270	12,270	12,595	12,595	12,595	13,090	12,100	12,835	12,280	13,045	
NPV	-5,895	-6,170	-5,615	-6,850	-5,295	-6,935	-4,650	-4,235	-7,210	-4,690	-4,770	-6,625	-5,165	-6,020	-5,405	-6,515	
BCR	0.53	0.51	0.55	0.47	0.57	0.46	0.62	0.65	0.43	0.63	0.62	0.49	0.57	0.53	0.56	0.50	
Wider Ec. Impacts	1,330	1,315	1,340	1,305	1,350	1,300	1,365	1,335	1,190	1,460	1,470	1,335	1,320	1,330	1,330	1,330	11
PVB	8,030	7,740	8,320	7,415	8,450	7,225	8,985	9,420	6,575	9,365	9,295	7,800	8,255	8,145	8,205	7,860	=8+9+10+1a+1b-7+11
PVC	12,595	12,595	12,595	12,960	12,395	12,860	12,270	12,270	12,595	12,595	12,595	13,090	12,100	12,835	12,280	13,045	=6
NPV	-4,565	-4,855	-4,275	-5,545	-3,945	-5,635	-3,285	-2,850	-6,020	-3,230	-3,300	-5,290	-3,845	-4,690	-4,075	-5,185	=PVB-PVC
BCR	0.64	0.61	0.66	0.57	0.68	0.56	0.73	0.77	0.52	0.74	0.74	0.60	0.68	0.63	0.67	0.60	

Table 6.11: Analysis of Monetised Costs and Benefits (AMCB) – Combined Sensitivity Tests

(PV for appraisal period 2003-2069, £ mill, 2010 prices/values, positive numbers are costs)

Impact	Central	Lower Combined Test	Upper Combined Test
Noise/local air quality	10	5	15
Greenhouse gases	35	25	45
Crowding, reliability, punctuality & quality	475	310	1,010
User benefits	4,955	3,325	8,640
Provider impacts	2,050	1,755	2,830
Wider Public Finances (indirect tax)	-825	-875	-940
PVB	6,700	4,545	11,600
PVC	12,595	13,095	11,375
NPV	-5,895	-8,550	225
BCR	0.53	0.35	1.02
Wider Economic Impacts	1,330	1,170	1,680
PVB	8,030	5,715	13,280
PVC	12,595	13,095	11,375
NPV	-4,565	-7,380	1,905
BCR	0.64	0.44	1.17

6.5. Conclusion

This chapter has summarised the public sector costs of the implementation of HS1 and associated services as set out by the NAO in their 2012 report. The only revisions are additional costs included to allow for the additional costs of remodelling King's Cross St Pancras associated with HS1 and an adjustment to allow for a reduction of the OMRC element of the HS1 TAC through time.

The comparison of estimated monetary values of the costs and benefits of the scheme over the appraisal period provides a central case BCR of less than 1 (0.53 without WEI and 0.64 with WEI). This indicates that monetised benefits do not fully cover scheme costs over the appraisal period with the PVC of £12.60bn and PVB of £6.70bn (without WEI) or £8.03bn (with WEI) generating a NPV of -£5.90bn (without WEI) or -£4.57bn (including WEI).

However the sensitivity tests undertaken also show that the results are sensitive to a range of assumptions with potentially significant impacts on results. Key influences include the assumption on subsidy and assumptions on values of time (and purpose split) and demand growth. Given the uncertainty in the forecasts of future performance, it is possible to envisage changes relative to existing assumptions for individual variables which would lead to a BCR of 1 or more.

Additionally, the sensitivity tests identified are not mutually exclusive and it is possible to envisage future scenarios in which several of the identified changes with either a positive or negative impact on the economic case for HS1 occur simultaneously, with larger cumulative impacts on the BCR than those identified in the table above for individual tests. As an example, the two combined tests described above resulted in BCRs ranging between 0.4 and 1.2 (with WEI). It is important to note that these values represent an illustration of the cumulative impacts of a combination of pessimistic or optimistic assumptions in relation to future scenarios. They do not reflect minimum and maximum possible values of the BCR. However, the size of the range highlights the importance of the assumptions made in relation to certain key future variables, particularly when possible variations are considered cumulatively.

Appendices

See Volume 2 of Report for Appendices

Appendices

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