Technical Annex: Evaluating the performance of private financing and traditional procurement

Methodology and findings of analytical framework pilot project

Contents

Introduction

The technical annex presents the methodology and findings from the pilot of the analytical framework, Figure 1, proposed in the National Infrastructure Assessment. The objective of the pilot was to develop insights on the practical application of the framework and identify where it needed to be revised. The pilot was completed with support from Highways England*. A summary report setting out the impact of the pilot findings on the Assessment proposals is presented separately. The annex presents the detailed methodology and findings of the pilot. The analytical findings have been used to populate the framework.

Summary

Selecting the pilot projects

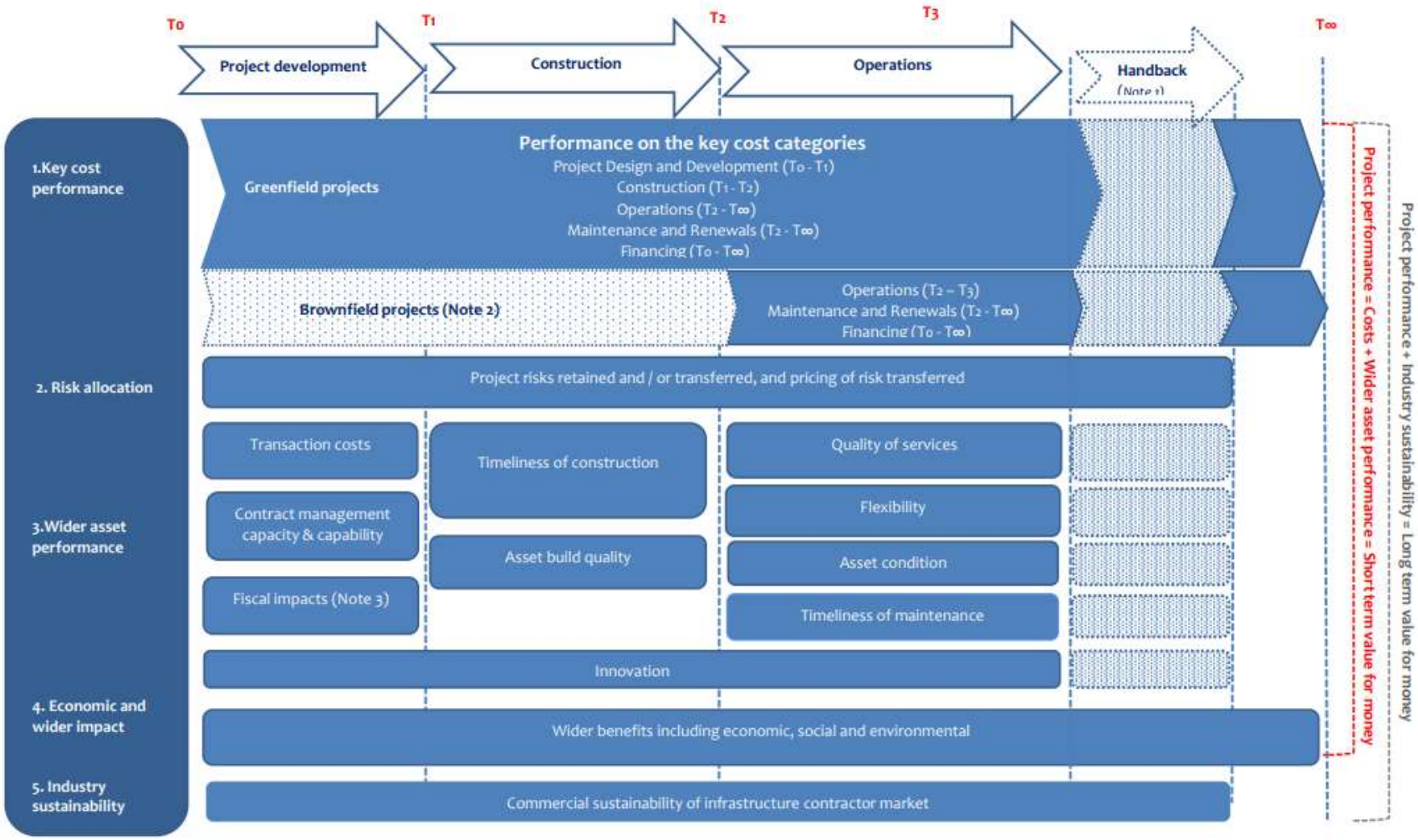
The criteria for selecting the private financed projects from the population of projects managed by Highways England (as of 31st March 2017[1]) were type of work, capital cost at financial close, the number of years the project has been in operation, and Highways England experience. The sample of three private financed projects informed the selection of the traditionally procured projects. In the absence of a systematic data set of all the projects that Highways England has delivered by traditional procurement, the Post Opening Project Evaluation (POPE) scheme data set was used. The criteria applied in matching the private financed projects to the traditionally procured projects were type of work, capital cost, procurement period, and regional location. Priority was given to the first two criteria in matching the projects. Challenges were faced in matching the projects using the latter two criteria. The selection of the projects for the pilot was discussed in consultation with an Advisory Group (set up to provide independent challenge over the course of the pilot).

Developing the analysis

There were no prescribed performance metrics established at the onset of the pilot. The project data provided by Highways England and the project companies (managing the private financed projects) was used to understand the performance of the projects in the dimensions of the framework. Where data availability and research evidence on outcomes was limited for example on innovation, a qualitative exploratory approach was adopted involving discussion with the project companies for example.

* Some reference in the report is made to the Highways Agency which was superseded by Highways England from 1st April 2015.

Figure. 1 Proposed analytical framework for evaluating the performance of private financing and traditional procurement



Note 1. For privately financed projects Note 2.Development and construction activities relating to existing infrastructure Note 3. Budget certainty and balance sheet treatment

Findings

Data availability

Data on projects delivered by traditional procurement was limited. The lack of data on these projects is related to the age of the projects selected; a portfolio approach to monitoring and recording outcomes and performance; and a lower level of importance to the value of data in the public sector. The better availability of data on the private financed schemes is driven by the private finance contract requirements on monitoring and reporting. Where limitations arose on these projects, it was in retrieval of earlier years data (in hard copy and now archived); accessing consolidated data of operations and maintenance performance which is reported monthly; and where data is not generally shared with the procuring authority in line with the operation of the risk transfer relationship. The type of data available had an impact on whether a quantitative or qualitative analysis of the framework dimensions was undertaken. Appendix 1 is a summary of findings on data availability.

Analytical findings

In the long-term, the Commission would like to develop a comprehensive evidence base of costs and benefits of private financing and traditional procurement. This project was focused on the more immediate challenge of testing the Commission's draft framework, using data on actual projects. The findings focus on where data was available under both procurement models. The overview also includes useful insights drawn from the private financed projects in areas such as risk allocation and innovation which are key elements of this model.

1. **Construction costs:** On a lane mile basis[†], construction costs on the private financed schemes were lower than on the traditionally procured projects. The two procurement models are inherently different and this makes like for like comparisons difficult. Evaluating overall construction cost performance needs to adjust for scheme configuration and topography amongst other factors.
2. **Operations and maintenance costs:** Cost and operational efficiencies have developed within Highways England over time. However, on a lane mile basis, the private financed projects still offer best value for operations and maintenance costs when compared to the regional operational area cost.
3. **Risk:** There are positive and negative differences to the annual unitary charge payment that Highways England has paid to the project companies on the private financed contracts to date. Part of this is attributed the impact of traffic volumes on the projects using a shadow toll payment mechanism and indexation assumptions. The analysis is

[†] Total costs / (Length of road x number of lanes). Used to normalise total costs (construction and operations & maintenance) to provide further insight on outcomes across projects.

lacking data before 2004. This was not readily available. Conclusions on the implications of the variance can only be drawn at the end of the contract life.

4. **Quality of services:** Deductions on the private financed contracts are designed to incentivise performance such as completing routine maintenance on time. Relative to what the project companies expected as set out in the financial models, actual deductions have been lower. This reflects the project companies seeking to manage the contract efficiently given penalties in place for missing service standards.
5. **Innovation:** Experiences in applying innovation show some common themes, such as the impact of the technical specification on the appetite to innovate. Other experiences have been unique to a project. The M25 project is not one of the projects in the pilot sample. However, for the purposes of exploring innovation outcomes (an area where there is limited research evidence), the project company was approached. Maintenance investment is a significant component of this contract. This has incentivised innovation in the operations phase.
6. **Wider benefits:** There is minimal monitoring of wider outcomes (economic, environmental and social) on the private financed projects although this can be inferred indirectly through some other data. For example, data on network availability reported by the project companies can be applied to infer economic benefit. The Post Opening Project Evaluations consider wider outcomes. However, the evaluations are limited in that they give a view only up to five years after scheme opening, and reports are prepared at a scheme level. A project may be a combination of schemes and have a number of associated Post Opening Project Evaluation reports.

Data on the private financed schemes enabled insights to be drawn on wider asset performance in areas such as asset condition and quality of services. This is not presented in the technical annex because of the absence of comparable data under traditional procurement. Post construction, a project delivered under traditional procurement is integrated into one of Highways England's fourteen regional operational areas. This presents a challenge to accessing operations phase performance data for discrete projects.

Methodology for selecting projects for pilot

Private financed projects

Projects were selected for the pilot using the criteria of type of work, capital cost, number of years in operation, and Highways England experience. The capital cost is based on the financial close data. The operational experience that the Highways England Department Representative (responsible for day to day contractual and operational oversight of the private financed projects) was considered a beneficial criterion to be reflected in the selection process. The population of private financed projects is from the portfolio managed by Highways England –Figure 2. In addition to these projects, the Advisory Group recommended consideration of the Mersey Gateway Bridge based on its capital cost.

The final population of private financed projects focused on projects that rely on public funding. On this basis the M6 Toll road project and Severn Crossings were excluded. The Severn Crossings had the benefit of access to whole life data, the asset having been returned to Highways England's ownership in 2018. However, the project lacks a traditionally procured match and it was not part of the Highways Agency roads private financing programme.

Selection of the final three projects from proposed options prioritised type of work (with focus on new construction and widenings), capital cost (with priority given to schemes with higher costs), and the length of operational life. The objective of the analytical framework is for whole life evaluation. The last criterion ensured projects that had been in an operations steady state for longer were selected. This led to projects such as the M25 and Mersey Gateway Bridge not making the shortlist as they were completed in more recent years.

Traditionally procured projects

The selection of matching projects delivered by traditional procurement was informed by the sample of the private financed projects. Each infrastructure project is unique. Identifying closely comparable projects was important to providing useful insights. In the absence of a systematic data set of all the projects that Highways England has delivered by traditional procurement over time, the Post Opening Project Evaluation[‡] data set, and its antecedents was used. Post Opening Project Evaluation reports have been prepared since 2001.[2] Evaluations assess the extent to which outcomes proposed at project appraisal have been achieved. This will include private financed projects completed after 2001. To date Post Opening Project Evaluation reports have been prepared for 85 schemes.

[‡] POPE reports are prepared one year and five years after major scheme opening and evaluate actual outcomes on a scheme against expected performance.

Of these 28 were eligible to match to the private financed projects (after exclusion of reports relating to the private financed projects).

The criteria for matching the traditionally procured schemes to the private financed projects were type of work, capital cost, procurement period, and regional location. Consensus on using these criteria was reached in consultation with the Advisory Group. Priority was given to the first two criteria. It was more challenging to match the procurement period and regional location criteria. Two projects completed under traditional procurement were selected. The A1 Dishforth to Leeming scheme in the Yorkshire and North-East region was considered a suitable match to the two private financed projects in that region. The match for the third private financed project is in a different region. Figure 3 summarises the approach adopted in selecting the traditionally procured projects. The final sample of projects in the pilot is summarised in Figure 4. A sample of five projects was settled on as suitable for testing the framework. A much larger sample would be needed to assess the overall costs and benefits of different procurement models, but that was beyond the scope of this project.

Figure 2. Population of private financed schemes delivered by Highways England based on PFI/PF2 Project list at 31st March 2017 published by IPA

Tranche		Project	Contract End	Date of Financial close	First date operations	Payment Mechanism	Estimated capital cost*	Contract years	Length	In addition to O&M, other works involved	Region
	1	Severn River Crossings	26/04/2022**	01/10/1990	26/04/1992	Tolled	£331m	30	3miles	Motorway river crossings	S.West
	2	M6 Toll	01/12/2049	01/02/1992	01/12/2003	Tolled	£485m	46	27miles	Construction of new motorway	W. Midlands
Tranche 1 Late - 1990's	3	A1(M) Alconbury to Peterborough	Mar 26	01/02/1996	01/10/1998	Shadow Toll	£128m	27	13 miles	Motorway widening	East
	4	A419/A417 Swindon to Gloucester	Apr 26	01/03/1996	01/02/1999	Shadow Toll	£110m	30	18 miles	Three new road sections	S. West
	5	M1-A1 Lofthouse to Bramham Link	Apr 26	01/03/1996	01/02/1999	Shadow Toll	£214m	30	18 miles	New motorway, motorway widening and interchange	Yorkshire& N.East
	6	A69 Carlisle to Newcastle	Apr 26	01/01/1996	01/05/1997	Shadow Toll	£9m	30	52 miles	Construct 3.5km by-pass	N. East
Tranche 1a Mid-1990's	7	A30/A35 Exeter to Bere Regis	Mar 26	01/07/1996	01/07/1996	Shadow Toll	£75m	30	19 miles	Construct two new sections and 9km by-pass	S. West
	8	A50/A564 Stoke to Derby Link	Jun 26	01/05/1996	01/03/1998	Shadow Toll	£21m	30	35 miles	Construct 5.2 km by pass	W. Midlands
	9	M40 Denham to Warwick	Jan 27	01/09/1996	01/12/1998	Shadow Toll	£65m	30	76 miles	Motorway widening	S. East
	10	A19 Dishforth to Tyne Tunnel	Feb 27	01/10/1996	24/02/1997	Shadow Toll	£29m	30	73 miles	Construct additional lane to existing dual carriageway.	N. East
Tranche 2	11	A249 Stockbury to Sheerness	Feb 34	01/02/2004	01/07/2006	Congestion Management	£73m	30	11 miles	Construct a 4.8 km by-pass/bridge	S. East

Tranche		Project	Contract End	Date of Financial close	First date operations	Payment Mechanism	Estimated capital cost*	Contract years	Length	In addition to O&M, other works involved	Region
Early-2000's	12	A1 Darrington to Dishforth	Feb 36	01/02/2003	01/05/2003	Congestion Management	£245m	33	33 miles	Construct two new sections of motorway and communications	Yorkshire& N.East
Tranche 3 Late-2000's	13	M25 Orbital	Sep 39	20/05/2009	01/09/2009	Availability	£983m	30	249 miles^	^63 miles were widened	More than one region

***** The estimated capital cost was used in selecting the pilot sample only. It is defined as Highways England's estimated capital cost had the asset been built by traditional procurement and not contracted out to the private sector. The costs were not used in the analytical work. Reference was made to the financial model and project company statutory accounts for construction costs (expected and actual).
****** Contract end date is earlier of debt being repaid or 2022 (based on 30-year concession)[4]. The project returned to Highways England ownership in 2018.

In addition to the above schemes delivered by Highways England, the Mersey Gateway Bridge (£589m capital cost; User pay; Financial close of 28/03/14; Opened for Operations on 5th Sept 2017; Located in North West; and Procuring authority is Halton Borough Council) was proposed for inclusion in the project sample because of its high capital cost.

[4] Severn River Crossing Plc 2016 Statutory Accounts
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/627180/print_severn-river-crossing-plc-2016-web.pdf

Figure 3. Approach adopted in selecting traditionally procured projects

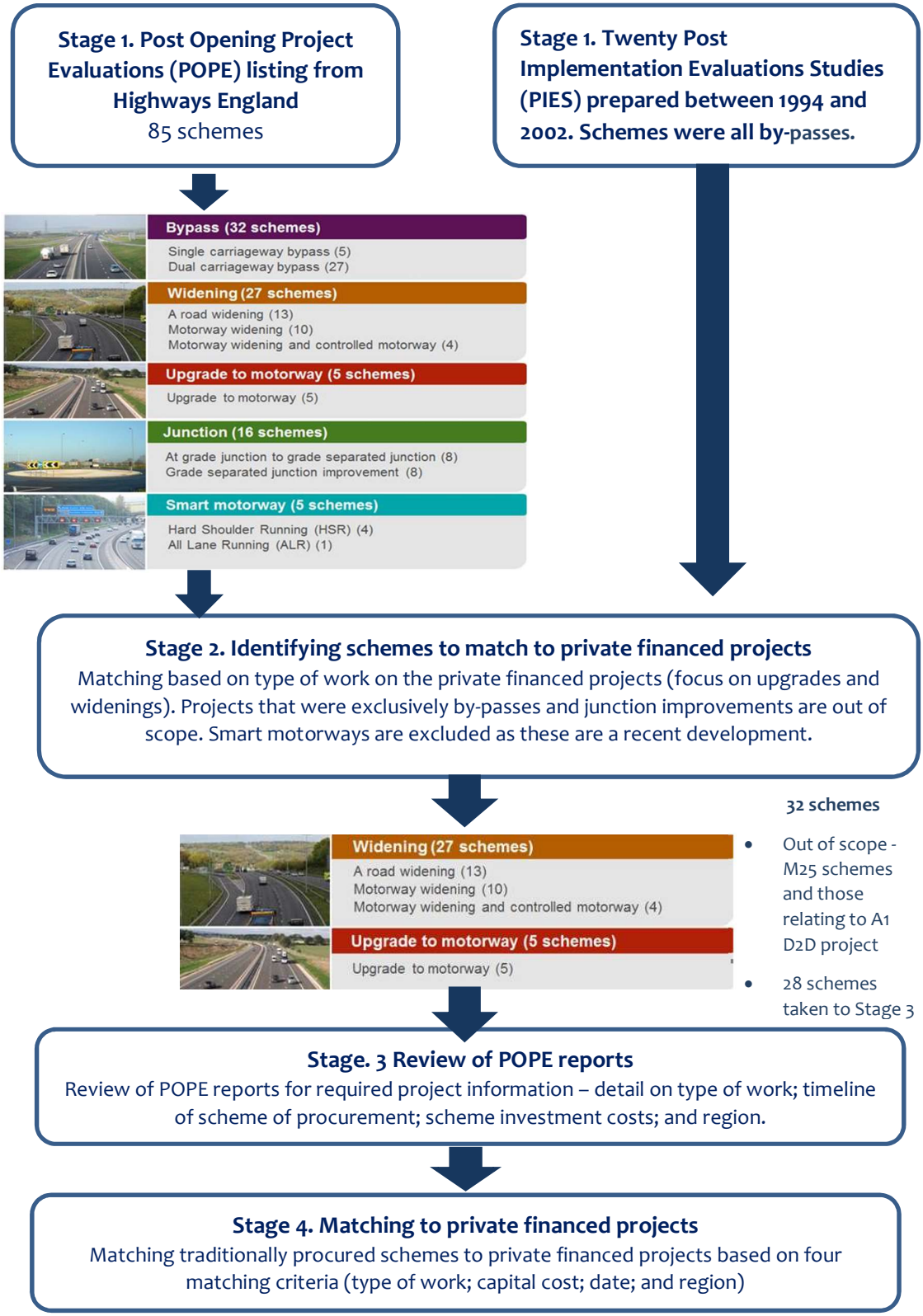


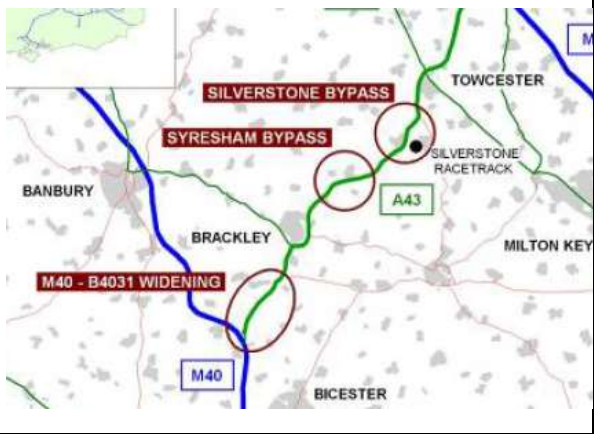
Figure 4. Summary of projects in pilot

Private financed projects

A1 Darrington to Dishforth (Tranche 2) • Capital cost - £245m • Type of works – construction of three new sections of motorway • Scheme opening - Jan 2006 • Length - 33 miles • Region – Yorkshire and North East • Payment mechanism – Congestion management • Project company – RMS (Darrington) Ltd	
M1-A1 Lofthouse to Bramham (Tranche 1) • Capital cost - £214m • Type of works – new motorway; motorway widenings; and interchange. • Scheme opening - Feb 1999 • Length - 18.6miles • Region – Yorkshire and North East • Payment mechanism – Shadow toll • Project company – Connect M1-A1 Ltd	

A419/417 Swindon to Gloucester (Tranche 1) • Capital cost - £110m • Type of works – construct three new road sections and three bypasses. • Scheme opening - Dec 1997 to Jan 1998 • Length - 32miles • Region – South West • Payment mechanism – Shadow toll • Project company – RMS (Gloucester) Ltd	

Traditionally procured projects

A1 Dishforth to Leeming • Capital cost - £251m • Type of works - upgrade to 13.7mile section of A1 to motorway standard. • Scheme opening - Oct 2011 to Mar 2012 • Length - 13.7miles • Region – Yorkshire and North East	
A43 Improvements • Capital cost - £116m • Type of works - upgrade to dual carriageway and construction of two by-passes. • Scheme opening - Sept 2002 • Length - est. 11.4 – 13.5miles • Region – East Midlands	

Populated analytical framework

The findings from the analysis of the five projects (presented in detail in the next section) have been used to populate the analytical framework.

Private financed projects

	To	T1			T2		T3	Handback	T∞
	Development	**Construction**			**Operations**				
	All projects	**A1 D2D**	**M1-A1**	**A419/417**	**A1 D2D**	**M1-A1**	**A419/417**		
1.Key cost performance									
a. Project development	Data not easily accessible								
b. Construction cost normalised £m (on lane mile basis)		£1.1m	£1.7m	£0.8m					
c. Operations & Maintenance					Costs calculated as a ratio relative to regional area operational costs.				
d. Financing costs	Part of unitary charge payment (see *Risk Allocation*). Difficult to disaggregate financing cost from the unitary payment and limitations faced with using project company accounts.								
2.Risk allocation									
a. Unitary charge variance to date					+£22m*	+35m*	(£34m) *		
b. Construction cost variance		+£1m	(£31m)	+£9m**					
c. Construction time performance		On time	On time	On time					

	To	T1			T2			T3	Handback	T∞
	Development	Construction			Operations					
	All projects	A1 D2D	M1-A1	A419/417	A1 D2D	M1-A1	A419/417			
d. Operations & maintenance***										
• Lane closures deductions					N/A	£0.05m	£0.1m			
• Congestion management payment deduction					£1.3m	N/A	N/A			
• Safety performance/(deduction)					£1.2m **** £(0.6m) ****	N/A	N/A			
3.Wider asset performance										
a. Transaction costs	Data on costs not readily available*****									
b. Fiscal impact		Whole life budget impact to be accounted for. Efficiency benefits across the project's life need to outweigh value of risk transfer.								
c. Construction time performance		*See Risk allocation section (c)*								
d. Timeliness of maintenance work					Indirect measure of performance by reference to lane closure charges. *See Risk allocation section (d)*					
e. Asset build quality		Records not readily available. ******								
f. Budget flexibility					Analysis of resource budget impact. On average total annual resource payments are £400m (2008 -2018) for all PFI contracts					
g. Asset condition and quality of services					No traditionally procured match for projects. Analysis not presented here.					

	To	T1			T2			T3	Handback	T∞
	Development	Construction			Operations					
	All projects	A1 D2D	M1-A1	A419/417	A1 D2D	M1-A1	A419/417			
h. Innovation	Evident in construction phase on projects									
4.Wider outcomes	No direct performance measures									
5. Industry sustainability	No analytical work. Proposed area for further research									

*Unitary charge payments commence from the start of operations and for this reason variance is shown in this phase. However, the unitary payment will also include repayment of the asset capital cost. The unitary payment for Tranche 1 projects using the shadow toll mechanism is affected by traffic variances.
** The forecast cost excluded interest cost. If this were accounted for it will have an impact on the implied cost overrun.
*** The main benefit of risk transfer in operations and maintenance relates to road pavement and structures condition, and it crystallises in the handback period.
****£1.2m from 2005 -2009; and (£0.6m) from 2011 – 2016.
*****Transaction costs of £8.3m on first four private financed projects relating to legal, technical, and financial services[6].
******Certificate of completion issued on project completion.

Traditionally procured projects

	To	T1		T2		T∞
	Development	Construction		Operations		
	All projects	A1 Dishforth to Leeming	A43 Improvements	A1 Dishforth to Leeming	A43 Improvements	
1.Key cost performance						
a. Project development	Data not easily accessible					
b. Construction cost normalised £m (on lane mile basis)		£3.07m	£2.15m			

	To	T1		T2		T∞
	Development	**Construction**		**Operations**		
	All projects	**A1 Dishforth to Leeming**	**A43 Improvements**	**A1 Dishforth to Leeming**	**A43 Improvements**	
c. Operations & Maintenance				Operational area costs calculated as a ratio relative to private financed projects		
2.Risk allocation	Not materially applicable to projects					
3.Wider asset performance						
a. Transactions costs	Data on costs not readily available.					
b. Fiscal impact	Whole life budget impact to be accounted for including cost of asset degradation.					
c. Construction time performance		On time	Delayed			
d. Timeliness of maintenance work				No data at project level. Performance monitored at regional operational area level		
e. Asset build quality		Data not readily available				
f. Budget flexibility				Analysis of resource budget impact. On average total annual current maintenance spend is £500m (2008 -2018)		
g. Asset condition and quality of services				Performance assessed at regional operation area level.		
4.Wider outcomes	No direct performance measures over life of projects. Assessed up to Year 5					
5. Industry sustainability	No analytical work completed. Proposed area for further research					

Analytical findings

1. Key cost performance

The analysis of budget and outturn costs in the distinct cost categories proposed in the framework cannot be made easily because of the different approach to accounting for costs under the two models. On the private financed projects, the cost to Highways England during the contract life is the annual unitary charge payment. The unitary charge payment cannot be easily disaggregated into the cost categories set out in the framework. Assuming the availability of data, calculating a shadow unitary charge payment for the traditionally procured projects is an alternative approach that will enable comparison of costs. However, this would still need to adjust for some effects of a whole life costed fixed price approach adopted under private financing. The same is not necessarily the case for traditional procurement.[3] The analysis of costs has referred to other sources of data.

Construction cost performance

Capital works on the private financed projects were completed within target cost - Table 1, as was one of the projects delivered under traditional procurement – Table 2. The M1/A1 was completed under budget. The A419/417 appears to be over budget. However, forecast cost is likely to be higher as interest costs were not capitalised in the financial model estimates (financing fees of £1m are included). The A43 project was over budget and delayed. This was attributed to a foot-and-mouth outbreak, poor winter weather, and additional work undertaken as part of preparation for the 2002 Formula One weekend.[4] Highways England do not generally have access to the actual capital cost on the private financed projects. This reflects the operation of the risk transfer relationship. Actual costs used in this analysis are based on the fixed asset cost disclosures in the project company statutory accounts. These may be affected by accounting policies including the approach to accounting for overheads and asset impairment.

Table. 1 Private financed projects construction cost performance

	A1 D2D	**M1-A1**	**A419/417**
Total capitalised cost (£m) *	235	267	122
Interest included in capitalised cost (£m) *	32	38	9
Total construction costs per financial close model including interest (£m)	234	298	113
Variance £m overspend/ (underspend)	1	(31)	9

	A1 D2D	M1-A1	A419/417
Normalised capitalised cost £m (on lane mile basis)	1.1	1.7	0.8
Structures constructed	34 bridges 243 Other	58 bridges 113 Other	22 bridges 28 Other

*Based on project company annual accounts

Table. 2 Traditionally procured projects construction cost performance

	A1 Dishforth to Leeming	A43
Forecast investment cost £m	286	60
Outturn £m	252	116
Variance £m overspend/ (underspend)	(34)	56
Normalised capital cost £m (on lane miles basis)	3.07	2.15
Structures constructed	11 new bridges 5 modified bridges 13 miles concrete barriers 27 miles drainage miles 26 gantries 14 balancing ponds Information and communication links	9 bridges 3 Culverts

The outturn cost on the A43 is closer to actual and forecast cost on the A419/417. The projects involved similar type of work. This implies initial cost underestimation on the project. Using a common basis (lane mile), construction costs have been normalised to provide insight on cost outcomes. Direct comparison of construction cost performance needs to further control for the impact on construction cost of scheme configuration (other assets and structures), topography, and location effects (weather and the traffic mix). Staff involved in delivery of projects have since moved on. This presented a challenge to obtaining explanation for variances in construction phase performance, and accessing project development phase data and costs.

Operations and Maintenance phase performance

Under traditional procurement, budgets and costs for operations and maintenance activities are managed at the regional area level. After construction completion these projects are integrated into one of Highways England fourteen operational areas. This presents a challenge to accessing project level cost data. Actual costs for operations and maintenance on the private financed projects are also not shared with Highways England, and the project

company statutory accounts disclosures do not provide a breakdown of the cost of sales category.

Operations and cost efficiencies have developed within Highways England since the procurement of the early private financed projects. An operations and maintenance benchmarking analysis was undertaken to test whether the costs on the private financed contracts still represented best value- Table 3. Due to the commercial sensitivity of regional area operations and maintenance costs to future procurements by Highways England, the results of the benchmarking analysis are not presented on a cost basis. They show the additional operational area cost relative to the private financed projects as a percentage.

Table 3. Operations and Maintenance cost benchmarking

	A419/417	**M1-A1**	**A1 D2D**
Region	South West	Yorkshire & North East	Yorkshire & North East
Operational area to Private financed contract *Additional cost per lane mile as %*	18%	7%	3%

Analysis of regional operations and maintenance costs is based on cost data from the last three years (the most robust data set available), divided by the lane mile in the region and excluding the lane miles of the private financed projects. The analysis of Highway's England's annual budget profile shows a stable maintenance cost profile (see section on Flexibility). It is noted that this relates to current maintenance only and excludes asset renewals. It can be assumed that using the last three years data is reasonably representative.

The financial model estimates are used to calculate the costs on the private financed projects. The financing arrangements of the project companies support the construction of the asset. Repayment of the financing costs is spread over the life of the contract. Financing is not taken on for operations phase activities. This cost is not a direct component of the operations and maintenance costs on the private financed projects enabling benchmarking to the regional operational area costs. The profit element included in the unitary charge has also been excluded. Lifecycle renewal and operations and maintenance costs have been annualised over the life of the contract, and indexation rebased to reflect actual inflation. The estimated savings on the private financed projects would decrease if the contract financing costs are accounted for, with varying impact to the value benefit on the three projects.

Understanding of performance in the operations phase would be enhanced by considering the operations and maintenance cost in conjunction with asset condition and other performance outcomes. Asset condition data at the project level is available on the private financed projects.

2. Risk allocation

The rationale for the private financed procurement delivery is risk transfer. The early private financed projects took on demand risk, through a system of shadow tolls, as well as construction risk and operations and maintenance risk. This can be thought of as transferring risk to the benefits case. However, there was no direct financial analogue in the traditionally procured projects, because road use is not charged for.

In the absence of business cases (and Cost Benefit Analysis used on the Tranche 1 private financed schemes), the financial close model was used as the base reference case.

Unitary charge payment analysis

At a high level, the variance in the cumulative base unitary charge payment was considered as reflecting the extent to which Highways England has benefited from risk transfer based on implications to its annual budget of over or underspend on the private financed contracts. There has been a variance in the base unitary charge payment – Table 4. Bundled as part of the unitary charge is payment for risk transfer from Highways England to the project companies in a number of areas. This presents a challenge to interpreting the relationship between the element of the unitary charge payment relating to the risk premium and the combination of risk transfers.

Table 4. Risk Allocation analysis – Unitary charge payment variance

		Total - 2004 to 2018
M1/A1	Forecast (£m)	644
	Actual (£m)	679
	Variance (£m)	35
	Variance as %	+5%
A419/417	Forecast (£m)	301
	Actual (£m)	267
	Variance (£m)	(34)
	Variance as %	- 11%

		Total - 2004 to 2018
A1 D2D	Forecast (£m)	304
	Actual (£m)	326
	Variance (£m)	22
	Variance as %	+7%

The analysis does not reflect payments before 2004 as this data is not easily available. Broadly, variances are attributable to differences in indexation assumptions and traffic growth performance (on the M1/A1 and A419/417, using the shadow toll payment mechanism). It is difficult to reconcile the unitary charge payment to the project company statutory accounts. The latter is affected by the project company revenue recognition policies; differences in accounting year end; and in addition to the base unitary charge payment, turnover may include income from contract variations. A conclusion on the implication of the variance to value for money can only be drawn at the end of the contract life.

The form of the payment mechanism introduces budget risk to Highways England to varying degrees. The Tranche 1 schemes use a shadow toll payment mechanism. This transferred demand risk to the project. However, since road users do not pay, it created budget risk for Highways England. The projects were procured at a time when forecasts to 2025 indicated rising traffic levels[5] and there was mixed experience of the robustness of traffic projections. On the Severn Crossings, traffic had been underestimated, growing by 63% between 1980-1990 with congestion in the summer months common.[5]The implication is that under conditions of rising traffic, the Highways Agency was not transferring any risk to the private operators. However, Highways England's exposure to growing traffic is capped under the shadow toll payment mechanism (£nil shadow toll payment after a top band upper limit).[6]

Decreasing traffic volume in 'Other vehicles' (non-HGV vehicles) on the A419/417 reflects sensitivity to economic costs of this user group, and shows the downside risk held by the project companies on schemes using the shadow toll payment mechanism – Figure 5. The analysis shows the level of difference between actual annual vehicle kilometres and forecasts. Values below zero reflect the extent to which traffic performance has fallen below expected levels (for 'Other vehicles' and 'Heavy Goods Vehicles traffic). The variance in traffic volumes doesn't mean that demand risk was not transferred ex ante. The project companies service their high gearing from the unitary charge payment, equity investors receiving a significant level of their return in the 'debt free tail' at the end of the contract. The fall in the annual

unitary charge payment below expectations has financial implications on the project companies.

Over time, Highways England refined the payment mechanism on the roads private finance contracts to be more aligned to its network management strategic objectives, adopting congestion management and availability based payment mechanisms on the Tranche 2 and Tranche 3 projects respectively.

Figure 5. Level of variance in 'Other Vehicles' and 'HGV' traffic projections M1-A1

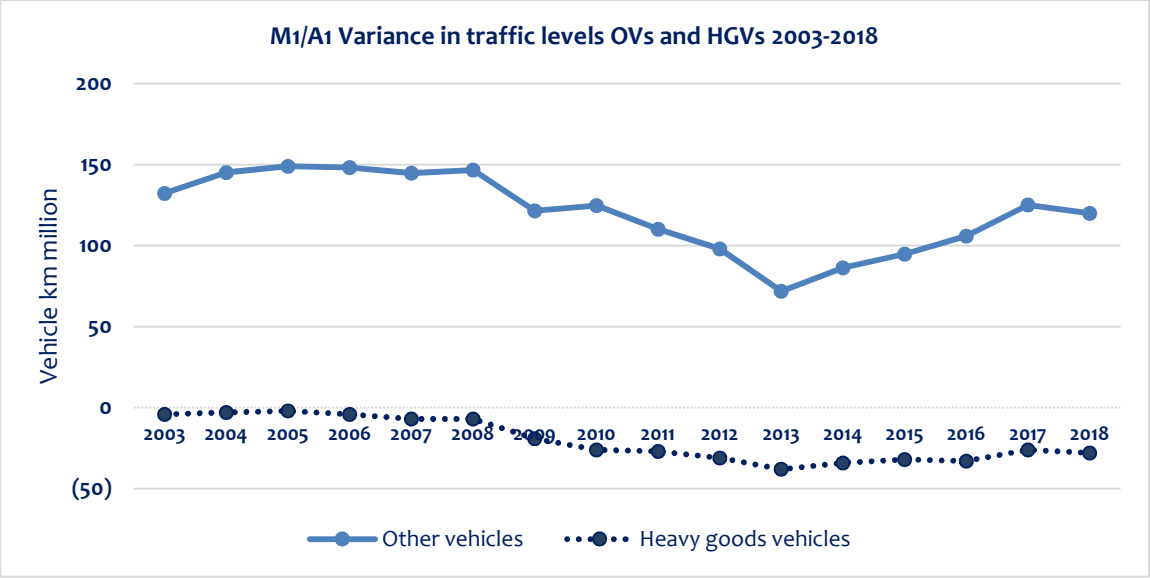
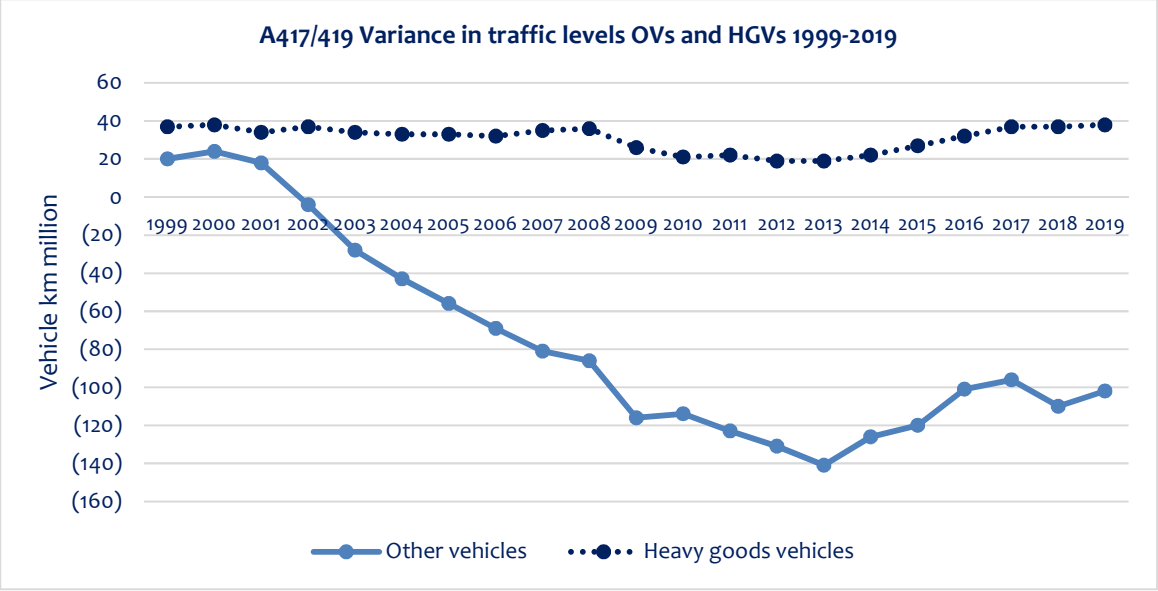


Figure 5. Level of variance in 'Other Vehicles' and 'HGV' traffic projections A419/417



The other significant risk that Highways England transfers to the project companies is for operations and maintenance work. The benefit of risk transfer for maintenance and renewals mainly crystallises when projects enter the handback period (five years from contract end date). Where the project company has not maintained the road pavement and structures to the expected standard, Highways England has the right to withhold part of the unitary charge payment as part of the retentions provisions of the contract. This gives the project company the opportunity to implement remedial action. The contracts have service level standards for repairs to defects such as potholes and on winter maintenance. In addition, performance deductions encourage the project companies to manage the network efficiently. In combination, these levers deliver an ongoing benefit to Highways England ensuring the road network is available and maintained to a good safety standard. Highways England and not the project companies faces the reputational risk for poor performance in operations activities.

Protestor action (from environmental lobby groups in response to growing traffic levels and adverse environmental impacts from projects) was a risk on the early private financed contracts.[7] The risk was higher on some projects than others. There was discussion between the Highways Agency and project companies on who was best placed to hold this risk.[8] The risk was transferred to the project companies. One of the project companies designed an innovative mechanism to manage this risk involving payment of a protestor action bonus to the construction joint venture company. Under traditional procurement protestor action would be treated as a civil disturbance and an employer risk to Highways England.

Deductions and incentives

The payment mechanism on the private financed contracts incentivises wider asset performance in the application of performance deductions and bonuses (lane closure charges; congestion management payment deductions on the A1 D2D; and safety performance payments). Lane closure charges – Table 5, are applied when routine maintenance works are undertaken outside the allowable window. They indirectly reflect timeliness of delivery of routine maintenance work. The oversight of the application of deductions and bonuses is reliant on effective contract management capability.

Table 5. Lane closure charges

	Cumulative Forecast to date	**Cumulative Actual to 2018**
M1/A1	£0.5m	£0.05m
A419/417	£12m	£0.1m

The low level of lane closure charges is attributed to efforts by the project companies to undertake routine maintenance works in the allowable window. An additional driver for performance is the requirement for the project company lenders to be notified when penalty points for failings are issued.[9]

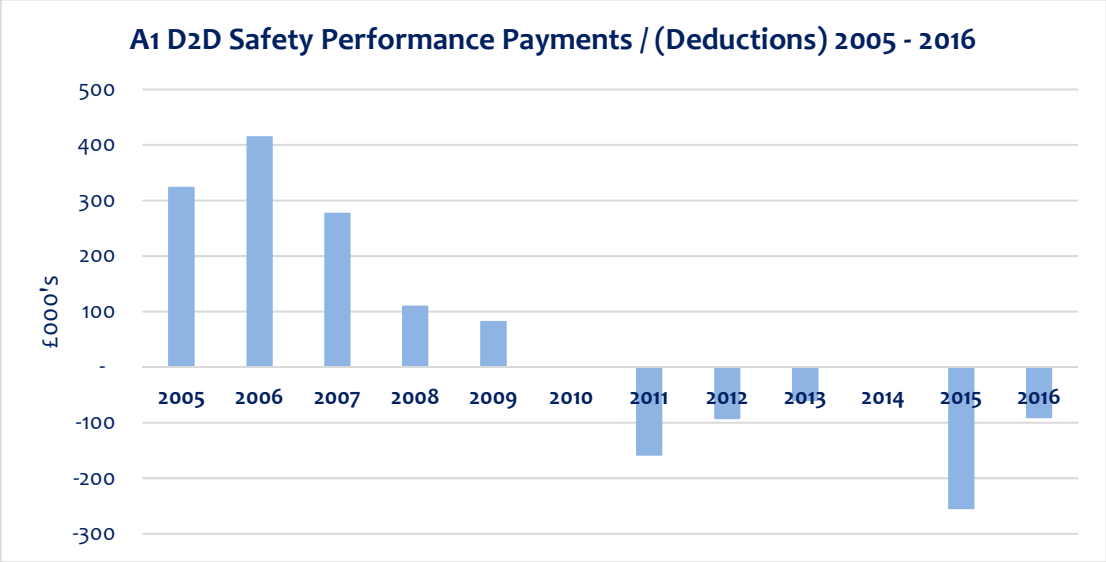
Congestion management payment deductions on the A1 D2D – Table 6, are applied where traffic flow is below 90km/hour.

Table 6. Congestion management payment deduction – A1 D2D

Cumulative Forecast to date	Cumulative Actual to 2018
£5m	£1.3m

Safety payments and/or deductions have been applied on the A1 D2D – Figure 6. The improvements in safety performance on surrounding roads and introduction of a smart motorway** has raised safety performance relative to the A1 D2D. This accounts for the shift in the safety performance adjustment from a payment to a deduction in recent years. The project company's performance is benchmarked to surrounding roads. Safety performance bonus payments require proactive action from the project companies.

Figure 6. A1 D2D Safety Payment Adjustments



** Section of motorway using technology for active traffic management to increase capacity and lower congestion in busy parts of the network. Smart motorways also make the hard shoulder available to traffic. https://highwaysengland.co.uk/programmes/smart-motorways/

Change

Post contract changes have an impact on initial risk transfer.[10] A major contract change was brought in by the Highways Agency in 2009 relating to winter maintenance standards. This applied to all contracts. Other changes to projects have been improvements to the scheme configuration and in response to enhanced industry standards. The nature of the changes on the contracts is not considered to have significantly impacted the original risk allocation. The impact on value for money of the additional costs for contract variations[11] must be considered in drawing conclusions on project performance at the end of the contract.

Project company financial performance

The project companies take on risk directly through the contract with Highways England, and indirectly through their highly geared financial structure. As expected in a project finance structure, risks transferred by Highways England do not sit with the project company but are passed through to related group company entities for construction, operations and maintenance, financing, and management and directors services. On the M1/A1 early construction completion resulted in the project company incurring additional costs of £6m from the construction joint venture company.[12] The profit margin (profit after interest but before tax to strip out the impact of high gearing) of the project companies indirectly gives an indication of the impact of risk allocation on financial performance. Inconsistency in annual accounts disclosures of shareholder and group loans limited the ability to undertake analysis of sponsor returns (with interest on shareholder loans considered as part of returns to equity). The challenge faced with using the statutory accounts for financial analysis highlight the benefit of improved transparency provisions such as on shareholder returns under the PF2 model.

3. Wider asset performance

Timeliness of construction completion

The private financed projects were delivered to time – Table 7, as was one of the projects completed by traditional procurement.

Table 7. Timeliness of construction completion

	Expected completion dates	**Actual completion date**
A1 D2D	Feb 2006	Sections available for use between Aug 2005 – Jan 2006
M1-A1	April 1999	Feb 1999 (Completion date) Nov 1999 (Issue of Certificate of completion)
A419/417	December 1998	Dec 1997 – Jan 1998 (Completion) July 1998 (Issue of Certificate of completion)

	Expected completion dates	Actual completion date
A1 Dishforth to Leeming	July 2012	Sections available for use between Oct 2011 – Mar 2012
A43 Improvements	Data not available	Data not available. Conclusion reached that project was delayed based on Post Opening Project Evaluation report findings on cost performance.

Timeliness of maintenance completion, quality of service, and asset condition

Data from the private financed schemes provided insight on quality of service performance (based on road user feedback and safety statistics), workforce health and safety performance, and asset condition. Indirectly lane closure charges reflect timeliness of maintenance work. Operations, maintenance, and renewals work is delivered at an operational area level for Highways England schemes under Managing Agent Contracts (MACs) and Asset Support Contracts (ASCs). Since 2016, Highways England has been rolling out it's the Asset Delivery Model. This will provide better control of maintenance and renewal works. The asset delivery model will replace the legacy maintenance contracts.

Analysis of a sample of projects by the National Audit Office showed reduction in cost variance on Managing Agent Contracts but potential for improvement on timeliness of maintenance delivery outcomes. [13] The portfolio level oversight of operations and maintenance performance on the traditionally procured projects limited the ability to allow comparison to the private financed projects. On the A43 improvements project, it was possible to derive costs of 'pavement only interventions' that have been completed since scheme opening. However, this required significant analytical work by Highways England. Major reconstruction of sections of the road pavement has been necessary to address the issue of the pavement depth at construction not being aligned with the high traffic numbers using the road.[14]

Transaction costs

These arise over the whole life of a project. In project development, costs arise for due diligence and client specification development. At contract signature, costs are incurred for legal, technical and financial advisory services, and in operations for contract management, market testing and technical advice. These costs are incurred by the public procurer and private sector operators. As expected transaction costs were higher in the earlier years of adoption of the private financed procurement model, relating to legal, financial and technical advice. This initial outlay was to benefit future procurements.[15] Project origination costs, departmental overheard, and consultancy support incurred by the public procurer under traditional procurement are unseen. Generally, high bidding costs in the infrastructure

contracting industry are a barrier to competition and impact long term value for money, a key part of the framework.

Contract Management

Relative to other public procurers, Highways England has an established centralised contract management function that oversees its private financed contracts. At the time the first four private financed projects were procured, the Highways Agency's contract management capability was limited and lessons from the first projects were applied to future private financed procurements.[16] A 2015 Price Waterhouse Coopers review of the eight Tranche 1/1a schemes and two Tranche 2 projects, (see Figure 2), aimed to identify potential opportunities for savings on the contracts[17]. The report noted the limited scope for operational savings on the contracts because:

- they do not have gain share provisions such as following a refinancing (refinancing clauses only on Tranche 2 and Trance 3 contracts). Highways England would have to rely on the Voluntary Code for the older contracts which requires sharing of 30% of refinancing gain with the public sector for refinancing's implemented after 30 September 2002.
- the ratio of capital to operating costs is higher on the projects relative to private financed contracts in other infrastructure sectors[††].

The report recommended rationalisation of reporting processes such as traffic data verification frequency and relaxation of some contracts provisions to achieve savings.

Fiscal impact

The fiscal impact of private financing and traditional procurement can be conclusively assessed at the end of the private finance contract, taking into consideration a range of factors (financial and non-financial) which align with the analytical framework. There is a fiscal impact that arises from the higher cost of private finance. The rates of return on private financed projects reflect the cost to public procurers of using this procurement route.[18] This cost needs to be weighed against the expected efficiency gains arising from the transfer of a range of risks through use of private finance.[19]Analysis by the government in 2003 showed the higher returns (and therefore the higher cost of using private finance) on earlier contracts diminished slightly on later contracts[20] and the cost differential between private and public financing may be smaller than expected.[21]

[††] Projects in Highways England's portfolio have varying levels of capital intensity (calculated with reference to the Infrastructure and Projects Authority annual PFI/PF2 list as 'Capital Cost / Total Sum of Unitary Charge Payments over the contract life'). Capital intensity is lower on the M25 contract for example where there is a higher maintenance and renewals investment component.

Further research of the cost premium of private finance is required that takes into consideration refinancing and subcontracting relationships.[22] This was beyond the scope of the pilot. However, the limited work undertaken in the risk allocation analysis demonstrates the limitations of using the project company statutory accounts because of the aggregation of costs and use of disclosure exemptions.

The efficiency benefits expected from using the private financing route would have to be equal or greater than the estimated value of risk transfer, if the value for money proposition for using private finance is to hold ex post. Estimating the expected efficiency benefit is difficult and focus tends to be on measuring cost efficiency.[23] Discussion with the Advisory Group highlighted the need to account for broader considerations such as asset condition in addition to cost efficiencies.

On the early procurements, part of the objective of the roads private financing programme was market testing. The schemes that went ahead did not necessarily qualify as a priority in the Highways Agency's wider capital programme.[24] This presents a limitation to inferences that can be drawn on efficiency benefits using analysis of projects that were not optimal options.

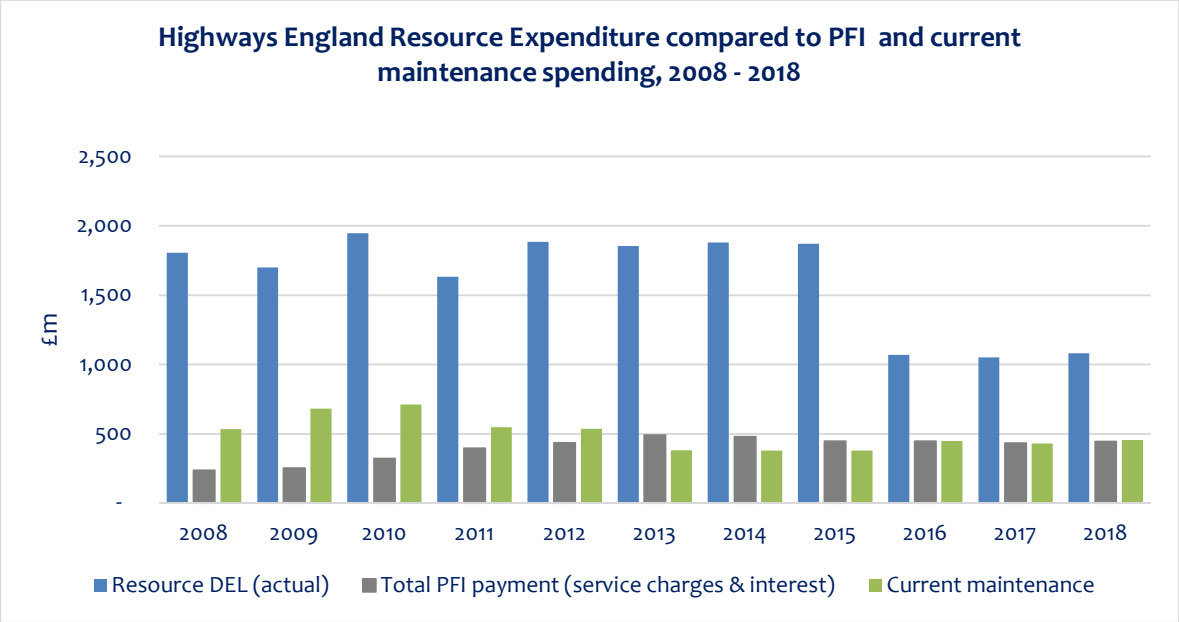
The budget impacts of private finance and traditional procurement in construction and operations are different.[25]The private financed projects contractual payments have a long-term impact on public sector budgets (see section on Flexibility). In future there is also the need to consider the long term fiscal impact of poorly maintained infrastructure. This may arise on public financed projects in response to funding pressures. There are costs attached to bringing assets back into good condition.

Flexibility

The analysis of Highways England's budget allocations (Resource and Capital) against spending profiles for asset renewals, routine maintenance, and contractual payments on the private financed contracts aimed to assess the impact of long term private finance contracts on the budget flexibility of public procurers. This analysis faced limitations. It was not possible to incorporate capital renewals spending in the analysis because of changes over time to Highways England's statutory accounts disclosures on these costs. Annual payments for the private financed contracts are mainly made from the Resource budget. Where the asset is treated as 'on balance sheet' for accounting purposes, there is also an impact on the Capital budget for repayment of the capital component. All of Highways England's projects are 'on

balance sheet' (under IFRS, UK GAAP and ESA[#] classification). The resource element is disclosed in the statutory accounts. The capital repayment component is not disclosed distinctly. The analysis in Figure 7 has focused on the impact of the private financed contracts on Highway's England's annual resource budget.

Figure 7. Highways England Budget allocations against PFI payments and maintenance



(Source: NIC analysis of Highways England statutory accounts)

Earlier years data from when the Highways Agency became an executive agency of the Department of Transport (DoT) in 1994 would have shown the budget impact of the private finance contracting approach from its inception. The agency's statutory accounts available in the public domain are from 2006 onwards. Data from the earlier years would have also provided insight on the maintenance spending profile. In the period leading to the late 1990s, the Department of Transport was dealing with a backlog of maintenance works and faced funding pressures.[26]

Within a collaborative project climate, the re-evaluation of the service specification especially where service standards are high, is one area for consideration where procurers are seeking budget savings. The operations and maintenance benchmarking shows the potential for the re-tendering of services on long term contracts after a certain period to ensure they still

[#] IFRS – International Financial Reporting Standards; UK General Accepted Accounting Practice (UK GAAP); and European System of Accounts (ESA) 2010. Assessment of Highways England balance sheet classification based on 'Infrastructure Projects Authority, Private Finance Initiative and PF2 projects:2017 Summary data'.

deliver value and address any inefficient risk pricing that may have arisen at procurement.[27] This may have the benefit of incentivising the project company operations and maintenance contractor to continue to innovate and seek efficiencies in operations, although the section on innovation shows a number of drivers impact innovation appetite.

Innovation

One of the then Highways Agency objectives in adopting the private finance procurement model was to promote 'innovation not only in technical and operational matters, but also in financial and commercial arrangements. [28] Innovation cannot be measured directly. Its benefits are inferred indirectly through impact in areas of the project's performance such as timeliness of construction and maintenance completion, cost savings and asset condition. Innovation can relate to process improvements such as those enabling timely completion of works, or product improvements such as road pavement materials. Evidence from the early private financed contracts indicated to then Highways Agency being more interested in innovation relating to financing arrangements.[29]

Innovation in financing was observed on the early projects through use of capital markets (e.g. a euro bond issue used to finance the RMS Gloucester and A1 (M) Alconbury projects).[30] This was innovative as it involved a single source of debt financing for two projects. Specification of technical requirements by the then Highways Agency and approved planning applications limited the scope for innovation on the first projects.[31] There are merits and shortcomings to holding to technical specifications. For Highways England it ensures consistency in assets across its network and this delivers a benefit when managing maintenance and renewals works. Box 1 reflects feedback from project companies on the experience of innovation on the private financed contracts. In the construction phase, the project companies pursued innovation. This contrasts with evidence from the National Audit Office analysis which noted minimal opportunity for innovation.

Tender evaluation documents on the first private finance contracts show bidders proposing variants to the technical requirements for construction works (for highway and pavement design, and structures). Some departures from standards conflicted with core requirements, but the Highways Agency noted some proposals as demonstrating innovative designs.[32] The Highways Agency had to engage substantially with the project companies in relation to their operations and maintenance proposals.[32] This may be explained by a lesser understanding of the service component on the early contracts, and the impact of different commercial interests influencing the project at different stages.[33]

Box 1. Innovation experience on highways projects

A419/417 - Tranche 1

- Innovation was actively pursued in the construction phase enabling timeliness of delivery of construction work.
- The project company has proposed innovation in the operations and maintenance phase but there is limited responsiveness to proposals by Highways England and lenders. The latter have to approve any proposals and are not usually open to introduction of new risks on a project that has stabilised for which they receive no upside benefit.
- Bridge designs put forward by the project company in the project development phase were an improvement to existing Highways Agency designs.

A1 D2D - Tranche 2

- The potential for innovation in the construction phase did exist but was not actively pursued. A review process is required where the project company proposes an innovation that is a departure from Highways England's technical standards. This adds to the project timescale and has an impact on the target completion date. It led the project company to adopt a 'safe build' approach mainly keeping to Highways England's technical specifications.
- Innovation was applied in pavement materials during construction and on the financial structure. Half of senior lending was provided by the European Investment Bank (EIB), and the other half bonds listed on the stock exchange.
- Participation in the construction joint venture by a Spanish contractor brought in a process innovation in the form of double handling of construction materials. At the time this was not standard UK construction industry practice.
- The drive to innovate in the operations phase has been limited. The project company continues to enhance the project's operational performance to keep up with industry standards and best practice.

M25 - Tranche 3

- In the construction phase, innovation and efficient procurement enabled early completion of widening works. This was enabled by quicker approval in departure from standards, and practices adopted in traffic flow management during construction for example. The monetary benefit of £160m from early completion was shared between the Secretary of State and Connect Plus.
- The M25 private contract is a performance-based service delivery contract with a fixed service payment adjusted according to the availability and the performance of the network. Most of the asset risk is transferred to the project company which is responsible for construction and subsequent lifecycle renewals and service delivery.
- The scale and specificity of the contract incentivises innovation and efficiency as the project company must do more with less. The drivers for innovation are the payment

mechanism and the asset management challenge (to maintain the asset, avoid penalties, and plan for the duration of the contract and beyond to ensure asset conditions are on target to meet handback requirements).

- Adoption of ISO 55001 standard has embedded asset management practice in the project company enabling longer term thinking and continuous improvement.
- The financial model assumed innovation would occur over the course of the 30-year contract, which incentivises Connect Plus to find innovation in financing, procurement, new methodologies and materials.
- The payment mechanism incentivises innovation with a pain/gain mechanism of the unitary charge. The payment mechanism aligns with Highways England objectives for the project and helps incentivise short term performance (monthly or annual measures). The Handback aspects help incentivise a long-term approach.
- Collaborative working with the supply chain through a 12-year framework, which is certified to ISO 44001, has supported innovation in the delivery of asset lifecycle renewals. Suppliers in the framework innovate with Connect Plus. The benefits from innovation are shared with contractors when savings are realised and there are also incentives to encourage collaboration across the framework suppliers. Improvements in delivery approaches re-baseline in new assumptions to ensure continuous improvement.
- Examples of innovation include the installation of radar detection units in the verge to monitor traffic. Traditionally this has been done by loops embedded in the pavement which are known to induce pavement failures and need to be replaced every time pavement related maintenance work is undertaken in the area. This initiative eliminates road and lane closures, also providing congestion and workforce safety benefits. The company has also developed a system which allows the replacement of large bridge expansion joints during a series of night shifts without requiring any speed reduction on the bridge during the day between the interventions. Another innovation is a system developed to rapidly replace concrete bays during a single night shift.
- An innovation and value steering group was set up in 2017 and provides a steer on innovation practice across the project and its stakeholders. An improved process to capture, develop and establish innovation is in place. The group comprises individuals from Connect Plus, Connect Plus Services (O&M provider), Highways England, and contractors on the framework. Funds are specifically ring-fenced for innovation by the project company (£200K for 2019/20), and an innovation board is tasked with deciding on proposals from the wider M25 supply chain.

London Borough of Hounslow Roads and Maintenance Pathfinder PFI

- Innovative contact design incentivised the project company to deliver on construction targets earlier as the payment mechanism stepped up over the five-year construction period to reflect early achievement of milestones. Streetlighting was upgraded in two years instead of five.

- As part of the procurement process bidders proposed targets on energy and carbon usage, and waste management. For carbon and waste management, this included carbon emitted and waste diverted over the contract term. In the operation of the contract any additional savings achieved in these areas that are above the bid level are shared by the local authority and project company.
- The project company applied the 'Link and Place' framework[34] developed by academics at University College London. This has informed the setting of performance standards for the street network, and output specification and targets for each infrastructure asset. Use of the 'link and place framework' has meant the project company looks on scheme not only as road contract but also a place contract.
- ISO55001 certification drives the focus on asset management.
- Full replacement of street lighting to LED (14,400 street lights replaced) has reduced energy costs. Retrofitting street lighting lamp posts is seeking to enable electric vehicle (EVs) charging. This reduces charging infrastructure installation costs, and in urban locations where space is constrained, addresses the challenge of having dedicated charging points.

4. Wider outcomes

Post Opening and Project Evaluation reports include an assessment of wider outcomes. The reports are limited in that they do not provide a whole life view of performance, assessing performance up to five years after project opening. On the private financed projects, direct monitoring and reporting of economic, social, and environmental wider outcomes are not explicit requirements of the contract. Wider outcomes can be indirectly inferred from some of the data collected as part of wider asset performance analysis such as on noise (environmental) and network availability and congestion management (economic benefit).

Discussion with the Chartered Institution of Highways Transportation indicate to limited evidence on the outcomes of the Highways Agency's objective of 'fostering the development of a private sector road-operating industry in the UK'. Setting aside the need to recycle capital by the sponsor construction companies, there has been a gradual divestment by companies that were attracted by the private finance model. This in part has been influenced by the absence of a pipeline. The potential for UK highways management experience to be exported internationally has been explored by UK Trade and Investment (UKTI).[35]In addition to roads construction and operations experience, the industry includes technology and advisory capability.

5. Industry sustainability

A competitive contractor industry supports realisation of long term value for money. Discussion with the Advisory Group acknowledged the importance of the 'financial sustainability of contractors' dimension in the framework. However, there was acceptance of the complexity involved in developing analysis of this dimension. No analytical work was undertaken as part of the pilot, and it is proposed as an area for further research. This will include consideration of risks transferred down the supply chain[36] and the impact of public spending on the financial performance of private sector partners.[37]

Disclaimer

Highways England has verified the data that it made available to the Commission from its internal records and bears no responsibility for data used in the analysis which has been obtained from other sources and the public domain.

Appendices

Appendix 1. Data availability on projects in pilot

Appendix 1. Data availability findings on projects in pilot

Data sources were considered as a robust source of evidence where there was an audit trail; they were prepared as part of statutory reporting processes; and where triangulation evidenced to the same fact.

Private financed projects

Framework category	Data sources	Type of analysis
Key cost performance	• Financial close models • Project company financial accounts from inception to date • Highways England analysis of unitary charge payments and regional area operations and maintenance costs • Design, Build, Finance and Operate (DBFO) contract. A form of PFI contract	Quantitative
Risk allocation	• DBFO contract • Financial close models • Actual traffic data on Tranche 1 schemes • Unitary charge payment analysis • Performance deductions data • Tender evaluation files for M1/A1 and A419/417 projects (provided by Department for Transport) • Change registers • Project company financial accounts from inception to date • The Private Finance Initiative: The First Four Design, Build and Finance Operate Roads Contracts, National Audit Office (1998)	Quantitative and Qualitative
Wider asset performance	• DBFO contract • DPI (DBFO Performance Indicators) Reporting from 2011 to date • Project Opening Post Evaluation (POPE) reports • Project company annual statutory accounts • PWC Contract Management Review report of Highways Agency DBFO contracts (2015) • Pavement survey results • Operations and Maintenance reports provided monthly to Highways England.	Qualitative

Framework category	Data sources	Type of analysis
Innovation	• Semi-structured interviews with the project companies (RMS Gloucester Ltd, RMS Darrington Ltd, and Connect Plus M25 Ltd); Hounslow Highways Ltd; the Institution of Civil Engineers (ICE); and Chartered Institution of Highways Transportation (CIHT) • Tender evaluation documents for the M1/A1 and A419/417 projects (provided by Department for Transport) • DBFO contract • The Private Finance Initiative: The First Four Design, Build and Finance Operate Roads Contracts, National Audit Office (1998)	Qualitative
Wider outcomes	• Project Opening Post Evaluation reports (for Tranche 2 schemes) • Operations and Maintenance reports • DPI (DBFO Performance Indicators) Reporting from 2011 to date	Qualitative

Traditionally procured projects

Framework category	Data/information sources	Type of analysis
Key cost performance	• Project Opening Post Evaluation (POPE) reports. These disclose construction costs only.	Quantitative
Risk allocation	Not applicable to schemes	
Wider asset performance	• POPE reports (such as on traffic flow outcomes) • Internal analysis provided by Highways England operational area team (pavement intervention costs on A43 improvements only)	Qualitative
Wider outcomes	• POPE reports, covering economic outcomes (including regeneration benefits), environmental, and social (include accessibility)	Qualitative

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