

Appendix A. Impact Assessment

Title: Dartford/Thurrock River Crossing Revised Charging Regime Lead department or agency: Department for Transport (Roads Policy) Other departments or agencies: Highways Agency	Impact Assessment (IA)
	IA No: DfT00086
	Date: 15/04/11
	Stage: Development/Options
	Source of intervention: Domestic
	Type of measure: Secondary legislation
Contact for enquiries: Eike Ndiweni-Muller	

Summary: Intervention and Options

What is the problem under consideration? Why is government intervention necessary?

The Dartford-Thurrock River Crossing (A282 trunk road) is a key link in the strategic road network, which facilitates the movement of goods and people. The Crossing suffers from significant levels of congestion, with over 50 million vehicles using it each year. This has negative impacts in terms of increased and unpredictable journey times with adverse consequences for business productivity. A road user charge has been collected at the Crossing since 2003, in order to manage the high demand for use of the Crossing. Government intervention is required to reduce congestion in the short and medium term and to secure the means for additional capacity in the Lower Thames area in the long term. Government intervention is required to increase charges as Government owns the Crossing and sets the charges.

What are the policy objectives and the intended effects?

The policy objectives are to reduce congestion at the Dartford-Thurrock River Crossing in order to maximise the benefit of this Crossing, by continuing to manage demand through setting an appropriate charge and providing Government with additional revenues to enable Government to prioritise investment at the Crossing including funding newer technologies for collecting charges to reduce delays at the barriers and the development and funding of proposals for additional crossing capacity in the Lower Thames. The intended effects are to manage demand for use of the Crossing to improve traffic flow and journey times in the short to medium term and to enable transport investment in the long term.

What policy options have been considered, including any alternatives to regulation? Please justify preferred option (further details in Evidence Base)

Options for reducing congestion at the Dartford Crossing and balancing this with the aim of providing a service for all road users wishing to cross the Thames in this area, include, in the short term altering the charges currently paid by users of the Crossing and, in the longer term, increasing the capacity of the Crossing or providing alternative means. This impact assessment considers the short term option and the means to take forward longer term options. It therefore analyses two options for altering road charges against a 'Do Nothing' option of keeping the existing charges unchanged.

Option 1 – increase annually the road user charge for all vehicles in line with the Retail Price Index.

Option 2 – implement step change increases in the charges in 2011 and 2012, followed by annual increases in line with the Retail Price Index up to 2015.

The impact assessment demonstrates that, of these two, Option 2 delivers the higher net benefit.

Will the policy be reviewed? It will be reviewed. **If applicable, set review date:** 04/2013

What is the basis for this review? PIR. **If applicable, set sunset clause date:** Month/Year

Are there arrangements in place that will allow a systematic collection of monitoring information for future policy review?

Yes

SELECT SIGNATORY Sign-off For consultation stage Impact Assessments:

I have read the Impact Assessment and I am satisfied that, given the available evidence, it represents a reasonable view of the likely costs, benefits and impact of the leading options.

Signed by the responsible SELECT SIGNATORY: Date:

Summary: Analysis and Evidence

Policy Option 1

Description: Annual increases to the current road user charges that are paid by users of the Dartford Crossing based on increases in line with the Retail Price Index (RPI)

Price Base Year 2002	PV Base Year 2002	Time Period Years 5	Net Benefit (Present Value (PV)) (£m)		
			Low: NA	High: NA	Best Estimate: £32.9m

COSTS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant Price)	Total Cost (Present Value)
Low	NA	5	NA	NA
High	NA		NA	NA
Best Estimate	£1.1m		-£4.5 m	-£14.4m

Description and scale of key monetised costs by 'main affected groups'

There will be an increase in Government revenue from the road user charges estimated at £20.5m. Owing to a reduced number of vehicle miles and reduced fuel consumption, there will be a decline in fuel duty revenues to Government estimated at £4.3m. Some changes will be needed to on road signage and a need to inform users of the Crossing (e.g. leaflets and publicity) as well as adjustment of software used to manage payments. These costs are estimated at around £0.7m.

Other key non-monetised costs by 'main affected groups'

No other significant costs are expected

BENEFITS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant Price)	Total Benefit (Present Value)
Low	NA	5	NA	NA
High	NA		NA	NA
Best Estimate	£0.0m		£5.6m	£18.55m

Description and scale of key monetised benefits by 'main affected groups'

Increasing costs would reduce travel times for journeys using the Crossing and in the surrounding area. This benefit to businesses is estimated at £27.9m and the benefit to consumers is estimated at £9.8m. There would also be benefits from a reduction in vehicle operating costs, which is estimated at £1.1m for businesses and £2.2m for consumers. These benefits would be offset by increased charges at the Crossing, estimated at £13.9m for businesses and £8.5m for consumers.

Other key non-monetised benefits by 'main affected groups'

No other significant benefits are expected

Key assumptions/sensitivities/risks

Discount rate (%) 3.5%

This impact assessment assumes that road user charges for use of the Crossing will increase in line with the Retail Price Index (RPI) each year from 2010 to 2015. Traffic growth forecasts are estimated using DfT software programmes (called 'Tempro' and 'TUBA') that use economic projections published by Government. It is possible that the actual outcome for key considerations (e.g. economic growth, traffic growth and the response of users of the Crossing to increased charges) will differ from the projections used in this impact assessment. These risks have been minimised by using published economic forecasts and applying transport modelling methods that are well established and widely used by the Department for Transport.

Direct impact on business (Equivalent Annual) £m):			In scope of OIOO?	Measure qualifies as
Costs: £2.8m	Benefits: £5.8m	Net: £3.0m	Yes	IN

Enforcement, Implementation and Wider Impacts

What is the geographic coverage of the policy/option?			Other - Dartford Crossing		
From what date will the policy be implemented?			27/11/2011 to be confirmed		
Which organisation(s) will enforce the policy?			Highways Agency		
What is the annual change in enforcement cost (£m)?			0		
Does enforcement comply with Hampton principles?			Yes		
Does implementation go beyond minimum EU requirements?			No		
What is the CO ₂ equivalent change in greenhouse gas emissions? (Million tonnes CO ₂ equivalent)			Traded:	Non-traded: +0.001mt	
Does the proposal have an impact on competition?			No		
What proportion (%) of Total PV costs/benefits is directly attributable to primary legislation, if applicable?			Costs: 0	Benefits: 0	
Distribution of annual cost (%) by organisation size (excl. Transition) (Constant Price)	Micro NA	< 20 NA	Small NA	Medium NA	Large NA
Are any of these organisations exempt?	No	No	No	No	No

Specific Impact Tests: Checklist

Set out in the table below where information on any SITs undertaken as part of the analysis of the policy options can be found in the evidence base. For guidance on how to complete each test, double-click on the link for the guidance provided by the relevant department.

Please note this checklist is not intended to list each and every statutory consideration that departments should take into account when deciding which policy option to follow. It is the responsibility of departments to make sure that their duties are complied with.

Does your policy option/proposal have an impact on...?	Impact	Page ref within IA
Statutory equality duties ¹ Statutory Equality Duties Impact Test guidance	No	26
Economic impacts		
Competition Competition Assessment Impact Test guidance	No	
Small firms Small Firms Impact Test guidance	No	26
Environmental impacts		
Greenhouse gas assessment Greenhouse Gas Assessment Impact Test guidance	Yes	21, 22
Wider environmental issues Wider Environmental Issues Impact Test guidance	No	21, 22
Social impacts		
Health and well-being Health and Well-being Impact Test guidance	No	
Human rights Human Rights Impact Test guidance	No	
Justice system Justice Impact Test guidance	No	
Rural proofing Rural Proofing Impact Test guidance	No	
Sustainable development Sustainable Development Impact Test guidance	No	

¹ Public bodies including Whitehall departments are required to consider the impact of their policies and measures on race, disability and gender. It is intended to extend this consideration requirement under the Equality Act 2010 to cover age, sexual orientation, religion or belief and gender reassignment from April 2011 (to Great Britain only). The Toolkit provides advice on statutory equality duties for public authorities with a remit in Northern Ireland.

Summary: Analysis and Evidence

Policy Option 2

Description: Increases to the current road user charges currently paid by users of the Dartford Crossing, in 2011 and 2012, followed by annual increases in line with the Retail Price Index (RPI). For cars the cash charge would increase from £1.50 to £2.00 in 2011 and to £2.50 in 2012. Charges for other vehicles would increase by similar proportions.

Price Base Year 2002	PV Base Year 2002	Time Period Years 5	Net Benefit (Present Value (PV)) (£m)		
			Low: NA	High: NA	Best Estimate: £117.4m

COSTS (£m)	Total Transition (Constant Price) Years	Average Annual (excl. Transition) (Constant Price)	Total Cost (Present Value)
Low	NA	NA	NA
High	NA	NA	NA
Best Estimate	£1.3m	-£22.2m	-£74.1m

Description and scale of key monetised costs by 'main affected groups'

There will be an increase in Government revenue from the road user charges estimated at £99.3m. Owing to a reduced number of vehicle miles and reduced fuel consumption, there will be a decline in fuel duty revenues to Government estimated at £22.8m. The costs of implementing the increased charges including publicity and amending the software for managing the payments, are estimated at around £0.9m.

Other key non-monetised costs by 'main affected groups'

No other significant costs are expected

BENEFITS (£m)	Total Transition (Constant Price) Years	Average Annual (excl. Transition) (Constant Price)	Total Benefit (Present Value)
Low	NA	NA	NA
High	NA	NA	NA
Best Estimate	£0.0m	£12.4m	£43.3m

Description and scale of key monetised benefits by 'main affected groups'

Increasing costs would reduce travel times for journeys using the Crossing and in the surrounding area. This benefit to businesses is estimated at £110.1m and the benefit to consumers is estimated at £38.4m. There would also be benefits from a reduction in vehicle operating costs, which is estimated at £1.2m for businesses and £12.2m for consumers. These benefits would be offset by increased charges at the Crossing, estimated at £77m for businesses and £43m for consumers.

Other key non-monetised benefits by 'main affected groups'

No other significant benefits are expected.

Key assumptions/sensitivities/risks

Discount rate (%) 3.5%

This impact assessment assumes a step change in the road user charges in 2011 and 2012. Traffic growth forecasts are estimated using DfT software programmes (called 'Tempo' and 'TUBA') that use economic projections published by Government. It is possible that the actual outcome for key considerations (e.g. economic growth, traffic growth and the response of users of the Crossing to increased charges) will differ from the projections used in this impact assessment. These risks have been minimised by using published economic forecasts and applying transport modelling methods that are well established and widely used by the Department for Transport.

Direct impact on business (Equivalent Annual) £m):			In scope of OIOO?	Measure qualifies as
Costs: £15.4m	Benefits: £22.3m	Net: £6.9m	Yes	IN

Enforcement, Implementation and Wider Impacts

What is the geographic coverage of the policy/option?	Other - Dartford Crossing				
From what date will the policy be implemented?	27/11/2011 to be confirmed				
Which organisation(s) will enforce the policy?	Highways Agency				
What is the annual change in enforcement cost (£m)?	0				
Does enforcement comply with Hampton principles?	Yes				
Does implementation go beyond minimum EU requirements?	No				
What is the CO ₂ equivalent change in greenhouse gas emissions? (Million tonnes CO ₂ equivalent)	Traded:		Non-traded: -0.024mt		
Does the proposal have an impact on competition?	No				
What proportion (%) of Total PV costs/benefits is directly attributable to primary legislation, if applicable?	Costs: 0		Benefits: 0		
Distribution of annual cost (%) by organisation size (excl. Transition) (Constant Price)	Micro NA	< 20 NA	Small NA	Medium NA	Large NA
Are any of these organisations exempt?	No	No	No	No	No

Specific Impact Tests: Checklist

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Wider environmental issues Wider Environmental Issues Impact Test guidance	No	21, 22
Social impacts		
Health and well-being Health and Well-being Impact Test guidance	No	
Human rights Human Rights Impact Test guidance	No	
Justice system Justice Impact Test guidance	No	
Rural proofing Rural Proofing Impact Test guidance	No	
Sustainable development Sustainable Development Impact Test guidance	No	

¹ Public bodies including Whitehall departments are required to consider the impact of their policies and measures on race, disability and gender. It is intended to extend this consideration requirement under the Equality Act 2010 to cover age, sexual orientation, religion or belief and gender reassignment from April 2011 (to Great Britain only). The Toolkit provides advice on statutory equality duties for public authorities with a remit in Northern Ireland.

Evidence Base (for summary sheets) – Notes

Use this space to set out the relevant references, evidence, analysis and detailed narrative from which you have generated your policy options or proposal. Please fill in **References** section.

References

Include the links to relevant legislation and publications, such as public impact assessments of earlier stages (e.g. Consultation, Final, Enactment) and those of the matching IN or OUTs measures.

No.	Legislation or publication
1	The Trunk Road Charging Schemes (Bridges and Tunnels)(England) Procedure Regulations 2001 (SI 2001/2303)
2	The A282 Trunk Road (Dartford-Thurrock Crossing Charging Scheme) Order 2008 (SI 2008/1951)
3	DfT Spending Review press notice 20 th October 2010. available at: http://nds.coi.gov.uk/clientmicrosite/Content/Detail.aspx?ClientId=202&NewsAreaId=2&ReleaseID=416118&SubjectId=36
4	Dartford River Crossing Study into Capacity Requirement (April 2009), prepared by Parsons Brinckerhoff for DfT. Available at: http://webarchive.nationalarchives.gov.uk/+http://www.dft.gov.uk/about/strategy/capacityrequirements/dartfordrivercrossing/

+ Add another row

Evidence Base

Ensure that the information in this section provides clear evidence of the information provided in the summary pages of this form (recommended maximum of 30 pages). Complete the **Annual profile of monetised costs and benefits** (transition and recurring) below over the life of the preferred policy (use the spreadsheet attached if the period is longer than 10 years).

The spreadsheet also contains an emission changes table that you will need to fill in if your measure has an impact on greenhouse gas emissions.

Annual profile of monetised costs and benefits* of policy option 2 - (£m) constant prices

	Y ₀	Y ₁	Y ₂	Y ₃	Y ₄	Y ₅	Y ₆	Y ₇	Y ₈	Y ₉
Transition costs	0.34	0.30	0.23	0.23	0.23					
Annual recurring cost	-9.48	-21.67	-24.18	-26.56	-28.87					
Total annual costs	-9.14	-21.37	-23.95	-26.33	-28.64					
Transition benefits	0.0	0.0	0.0	0.0	0.0					
Annual recurring benefits	4.60	11.15	13.23	15.43	17.75					
Total annual benefits	4.60	11.15	13.23	15.43	17.75					

* For non-monetised benefits please see summary pages and main evidence base section

The “annual profile of monetised costs and benefits” table above shows that total annual benefits are projected to increase in real terms annually throughout the appraisal period.

For emission changes table, see **Annex 4**

Evidence Base (for summary sheets)

1.0 Problem under consideration

Background

1.1 The Dartford-Thurrock River Crossing is a key part of the strategic road network. It consists of two two-lane tunnels carrying traffic to the north, and a four-lane cable stayed bridge (the Queen Elizabeth II Bridge) carrying traffic to the south. The Crossing spans the River Thames between Dartford and Thurrock, forming a trunk road link (the A282 Trunk Road) in the M25 orbital motorway. The Queen Elizabeth II Bridge at Dartford was opened in 1991 under a concession agreement. This agreement included taking over the operation and maintenance of the two existing Dartford Tunnels. The concessionaire was permitted to charge tolls until the debts associated with the construction of the bridge and tunnels had been fully discharged.

Road user charging at the Dartford Crossing

1.2 Tolling at the Crossing finished in March 2003. In light of a study for the Department for Transport¹ which reported findings that traffic levels would be an estimated 17% higher if tolling was removed and following public consultation, the Government decided to implement a charge at the Crossing at broadly the same levels as the tolls, using the powers in the Transport Act 2000. The charge was implemented in 2003 for the purpose of managing the high demand for use of the Crossing. In accordance with the Transport Act 2000 the net revenues are used to fund transport improvements.

1.3 The Department for Transport (DfT) reviewed the charging regime at the Crossing in light of traffic and congestion levels, and following consultation, revised the charging regime in 2008. This resulted in changes to the charging rates, amended timings of the operation of the charging regime (charges levied between 6:00 am to 10:00 pm, with a period of no charge between 10:00 pm and 06:00 am), and the introduction of a discount scheme for local residents.

1.4 Details of the current charging regime are set out in the A282 Trunk Road (Dartford-Thurrock Crossing Charging Scheme) Order 2008. This stipulates the time of operation of the charging scheme, the individual cash rates payable by class of vehicle, as well as details of the vehicle classification and those vehicles exempt from the Crossing charge. The Order also provides the power for the Secretary of State to amend the rate of the charge in line with changes to the Retail Price Index. However, such changes have not been regularly made at the Crossing, because of concerns that multiple coin transactions are likely to cause delays at the payment booths at the Crossing.

1.5 Analysis undertaken by the Department for Transport shows that an increase in the charge paid would reduce congestion by dissuading some road users from using the Crossing. In turn, this would lead to reduced journey times and hence benefits from time savings for road users who continue to use the Crossing. Analysis by the Department for Transport has shown that almost all road users put a monetary value on saving travel time, with the value generally being greatest for those who are travelling on business. The road users who are dissuaded from using the Crossing may choose to travel to different destinations or by another mode. They experience a loss in benefit because they no longer make their preferred trip. Of the road users who continue to use the Crossing, some will experience a loss in overall benefit if the increase in the charge is perceived to exceed the value they put on the time savings. Others experience an overall gain in benefits if they value the time savings that result from the less congested Crossing, more than the loss they perceive to result from the increase in the charge.

1.6 In aggregate, for increases in the charges that have been considered by DfT, the value of the time and fuel cost savings that remaining users of the Crossing experience exceeds the costs borne by those who decide against using the Crossing after the charge increase. In addition, money is transferred between road users and Government, with motorists paying a higher charge, but marginally less fuel tax because of reduced fuel consumption due to the reduced congestion and improved traffic flow.

¹ 'Short term extension of Dartford Tolls', report by Brown & Root for DfT, August 2001.

Comparison with other river Crossings

1.7 Table A below identifies prices which users of other river crossings are required to pay. By comparison the charges levied at the Dartford Crossing appear relatively low.

Table A. Prices charged at sample river crossings

	Vehicle Class	Humber Bridge ²	Severn Crossing ³	Dartford Crossing
Passenger Vehicles	Motor Cycles	£1.20	Free	Free
	Car	£2.70	£5.70	£1.50
	Mini-Bus ⁴	£4.90	£11.50	£2.00
	Coach	£10.90	£17.20	£2.00-£3.70
Goods Vehicles	Van ⁵	£2.70	£11.50	£2.00
	Large Van	£4.90 - £14.60	£17.20	£2.00-£3.70
	HGV	£18.30	£17.20	£3.70

Current performance of the Dartford Crossing

1.8 In April 2009, the Department for Transport published the *Dartford River Crossing Study into Capacity Requirement* report⁶. This considered the current and future performance of the Dartford-Thurrock River Crossing.

1.9 Daily flows of vehicle journeys over the Crossing were estimated by the 2009 study at between 145,000 to 150,000 vehicles per day, split fairly evenly by direction. The study concluded that the number of vehicle journeys over the Crossing each day, both in the morning and evening and at other times of the day, was above the number for which the Crossing had capacity. The report found that the overall number of vehicle journeys using the Crossing had reduced slightly in the last few years but the make up of traffic had changed, with a greater number of HGV movements⁷. The report found that the Crossing did not demonstrate typical flow patterns, as there was no pronounced morning or evening peak. Instead flows were consistently high across the day, with a maximum flow around 5:00 pm to 6:00pm each day.

1.10 The study reported that the section of the road network which includes the Dartford Crossing has been found to experience the third highest level of delay nationwide. More recent analysis confirms that this section of the road network continues to have the highest levels of delay for journey using this

1.11 The 2009 study showed that the relationship between speed and flow on the Crossing is such that journey times show a great deal of variability and delay when traffic flows exceed 4,000 vehicles per hour. For example, once traffic flows exceeded 3,000 vehicles per hours, delays were in the region of 9 minutes per vehicle. The levels of demand flows during daytime hours were at or above the levels that can be supported by the Crossing, leading to extensive queues and delays that affected all users. At the same time, conditions at the Crossing were not always predictable. This unpredictability was exacerbated by road traffic incidents.

1.12 The 2009 study highlighted that the injury accident rate for the road network surrounding and including the current Crossing was high and that the range of these incidents were caused by complex and inter-related factors. These ranged from the complexity of the surrounding network and spacing between junctions, to the merging and weaving of traffic approaching the Crossing, breakdowns and the physical capacity of the northbound tunnels. Combined with the high levels of demand flows in both directions, this meant that the Crossing had little resilience to incidents when they occurred.

² http://www.humberbridge.co.uk/toll_information/toll_charges.php

³ http://www.severnbridge.co.uk/toll_prices.shtml

⁴ Up to 17 seats.

⁵ Up to 3,500kgs.

⁶ Dartford River Crossing Study into Capacity Requirement (April 2009), prepared by Parsons Brinckerhoff for DfT. Available at: <http://webarchive.nationalarchives.gov.uk/+http://www.dft.gov.uk/about/strategy/capacityrequirements/dartfordrivercrossing/>

⁷ Ibid; the report noted that the proportion of light vehicles had decreased by 9-10%, while the proportion of heavy goods vehicles (HGVs) had increased by 11-12%, with the greatest increases in a northbound direction.

1.13 Evidence from the Highways Agency Traffic Information System⁸ over the past 5 years consistently shows average delays of between 7-11 minutes for the slowest 10% of journeys on the M25 J30-7 section which includes the Crossing. This is among the highest level of delay on the network nationwide.

Future levels of performance

1.14 The 2009 *Dartford River Crossing Study into Capacity Requirement* report assessed the future performance of the Crossing, given the predicted levels of traffic growth, the impacts of the planned expansion of the Port of Dover, and the planned growth and housing in the Thames Gateway area.

1.15 It concluded that the situation would worsen significantly. The report summarised the results of transport modelling which forecast that demand for Crossing capacity will increase by 38% by 2031. These forecasts were estimated using a widely used transport model for the East of England (the East of England demand model). Similar levels of demand increase were found to be predicted by an alternative model referred to as the South Essex Land Use and Transport model). The Great Britain Freight Model⁹, which is developed and maintained by the Department for Transport, forecast a growth of 30% in HGV trips using the Crossing in 2030. These levels of forecast demand could not be accommodated by the existing Crossing, which is already operating at its effective capacity. The current performance of the Crossing would therefore worsen over time, leading to increased times for specific journeys, worsening reliability of the time it would require to undertake journeys, and subsequent negative economic and environmental impacts.

1.16 The study reported that the Dartford Crossing's performance is sub-standard in comparison with other elements of the national road network, and that its performance was set to worsen over the longer term, with negative impacts to businesses using the Crossing and in the surrounding area, and the potential to impede economic growth.

1.17 The study looked at major infrastructure options for the provision of additional capacity and provided a high level assessment of the impacts of such provision, and the degree to which they could address the issues at the existing Crossing. It considered five major options, which originated from the identification of possible improvement corridors selected from previous studies, stakeholder consultation, and a review of current land use and transport infrastructure.

1.18 The study concluded that three of the five options had the potential to address the issues at the existing Crossing in the longer term, although one of the routes is constrained by the proposed housing development at Eastern Quarry.

Revenues from charging and transport investment

1.19 The road user charges at the Crossing are determined under powers agreed by Parliament found in the Transport Act 2000. Amongst other things the Act also provides that revenues from a trunk road user charge must be spent on transport (see schedule 12 paragraph 13(1)). Ministers have made clear that they do not intend to change the law to further ring fence such income.

1.20 Currently revenues from the Crossing are around £70 million per year. In the region of £25 million is spent on maintenance and operating costs for the Crossing, and the remainder, around £45 million, is invested in transport. The Department for Transport has invested in a number of transport projects that, previous transport modelling and appraisal of these investments shows, have directly benefited users of the Crossing such as major enhancements to the main roads south of the Crossing.

1.21 Given the continuing predicted longer term growth in traffic, driven by GDP growth and population growth, Government has to consider how additional road capacity or more effective use of road capacity,

⁸ The Highways Agency currently maintains, operates and develops three traffic databases and associated applications. The Traffic Flow Data System (TRADS) holds information on traffic flows at sites on the network. The Journey Time Database (JTDB) system holds information on journey times and traffic flows for links of the network. These two databases are known collectively as the HA Traffic Information System (HATRIS). Further information is provided at <http://www.hatris.co.uk/>

⁹ Further information on the Great Britain Freight Model (GBFM) is available at <http://www.dft.gov.uk/pgr/economics/rdg/gbfreightmodel/>

can be delivered cost-effectively in those places where it is most critically needed. In developing future plans, and in the light of funding constraints, it is important to ensure that Government is managing road capacity effectively to meet the needs of users and others affected by transport. As part of the continuing and planned spending programme, the Department for Transport is currently upgrading sections of the M25, for which the Dartford Crossing forms a vital link for crossing the Thames between Kent and Essex.

1.22 The Department for Transport set out in its Spending Review announcement on 20 October 2010 that improvements at the Dartford Crossing are an important priority, and that it would take forward proposals to address the current levels of congestion by making use of newer technology to collect the charge at the Crossing, and doing so in a way that allows a better flow of traffic and reduced delays, while ensuring continuing safe operation.

1.23 The Department for Transport also made clear that it will consider lifting the barriers at the Crossing when congestion is particularly severe, and where the need to collect charges is contributing to that congestion. However, this is only a very short term solution as the failure to levy a charge risks encouraging more traffic to use the Crossing. Any solution would however, need to take account of the potential benefits and impacts, and the need to maintain the safe operation of the Crossing for its users.

1.24 The Department for Transport has recognised that, based on projections of traffic growth, in the longer term additional capacity is needed at the Dartford Crossing and that, with current Government spending plans, the availability of public funding to provide it, will be constrained. The Department for Transport has committed to undertaking a review of potential new additional crossing options. The 2009 *Dartford River Crossing Study into Capacity Requirement* report estimated that the cost of additional Crossing capacity could be in the order of £1bn-£7bn. Given current public spending plans, the likelihood of central Government funding to meet the total costs of such a large infrastructure project are unlikely. However, the Department for Transport recognises that there is a need for potential crossing proposals to be sufficiently developed by Government, in terms of preparation costs, design costs, and potentially up front land costs, before options such as development of a private sector funded vehicle for the potential delivery of such major long-term infrastructure improvements would be feasible.

2.0 Rationale for intervention

2.1 Road congestion is caused by traffic levels in excess of the maximum efficient capacity of a network, or by disruptive events. It is a barrier to a well functioning transport network and, particularly by increasing journey times for businesses, reduces business productivity. Congested road conditions can also increase negative environmental impacts of road traffic because pollutant emissions from road traffic are affected by vehicle speeds¹⁰. Roads operating above capacity also tend to have worse accident rates¹¹. Research shows that road users place importance on saving time when travelling and on the predictability of journey times. Interventions that reduce congestion generally result in more reliable journeys¹².

2.2 In order to address the congested road conditions on the Dartford Crossing, the Department for Transport has identified the need to increase the level of the road user charge for the Crossing and has formulated the proposals which are subject of this Impact Assessment. Other measures, focused on assisting the improvement of traffic flow in the medium term and increasing transport capacity for the Lower Thames Crossing, take longer to implement than an increase in the Dartford Crossing charges and the Spending Review has reduced the budget for new infrastructure. Department for Transport is developing the other measures for implementation in the medium to long term.

2.3 Increasing road user charges at the Dartford Crossing will decrease demand for the use of the crossing. This reduction in demand will lead to a decrease in congestion on the crossing, an increase in

¹⁰ Further information on estimation of emissions based on vehicle speed is provided at <http://www.dft.gov.uk/webtag/documents/expert/pdf/unit3.3.3d.pdf>

¹¹ Further information on estimation of accidents rates is provided at <http://www.dft.gov.uk/webtag/documents/expert/unit3.4.1d.php>

¹² Further information on valuation of journey time reliability is provided at <http://www.dft.gov.uk/webtag/documents/expert/unit3.5.7.php>

average vehicle speeds and a reduction in journey times for those road users who continue to use the Crossing. Whether specific individual road users continue to use the Crossing would depend largely on the value that they place on the reduction in journey times and on the attractiveness of the alternatives to using the Crossing. Road users with per vehicle value of time, for the reduced journey time, that is lower than the additional charge would experience an overall cost, while other road users would benefit because the time savings are worth more to them than the additional charge.

2.4 However, even taking account of effect of increased charges on congestion and planned improvements to traffic flow at the Crossing, traffic is forecast to grow. The Department for Transport has recognised that, based on the projections of traffic growth, in the longer term additional capacity is needed at the Dartford Crossing. In the context of financial constraints set by the Spending Review, the proposed increased charges at the Dartford-Thurrock River Crossing, and the subsequent increases in net revenues to government from charge receipts, would allow the Department for Transport to continue to prioritise investment in developing and funding proposals for additional crossing capacity in the Lower Thames.

2.5 The proposed charge increases are therefore a measure to mitigate congestion at the Dartford Crossing in the short term by managing demand for the Crossing and in the long term by providing funding to develop additional Crossing capacity. Options for increasing Crossing capacity would be subject to separate economic appraisal following Department for Transport investment appraisal requirements.

3.0 Policy aim and objectives

Aim

3.1 The aim of this policy is to reduce congestion on the Dartford Crossing.

Objectives

3.2 The objectives of this policy are:

1. To continue to manage demand for use of the Crossing and reduce the impacts caused by levels of congestion at the Crossing.
2. To provide Government with additional revenues to allow the Department for Transport to continue to prioritise development and funding of proposals particularly for the provision of additional crossing capacity in the Lower Thames.

4.0 Description of options considered

4.1 This Impact Assessment considers alternative options of raising the Crossing charges as a short term measure. This is in the context of the Department developing other medium and longer term measures to address congestion at the Crossing. The impact assessment considers two policy options of raising the Crossing charges against a Do Nothing option of retaining the existing Crossing charges. Descriptions of the Do Nothing and the two policy options are set out below, illustrated by tables of prices under each option during the five years of the appraisal period. The Department considered that it was proportionate to appraise two options against the Do Nothing.

Do Nothing Option

4.2 The Do Nothing option assumes the continuation of the current road user charging regime throughout the appraisal period up to 2015, including times of operation and the specific charges levied for individual vehicle classes. The costs of operating and maintaining the current charging regime are not identified as they are assumed to remain constant in real terms for each of the policy options assessed. Allowing for inflation, the Crossing charge rates would decrease in real terms.

4.3 The rates for the road user charges as currently set out in the A282 Trunk Road (Dartford-Thurrock Crossing Charging Scheme) Order 2008 are summarised as cash charges in the table below. The table also sets out the Dart-Tag charge rates. These are a discounted rate for users of the Crossing who have pre-paid the charge through the Dart-Tag system in accordance with a composite agreement provided by the current Charging Scheme Order.

	Current Day charge (6am-10pm)	Current Night charge (10pm-6am)
Motorbikes	Free	Free
Cash charge		
Cars	£1.50	Free
2 Axle Goods	£2.00	Free
Multi Axle Goods	£3.70	Free
Dart-Tag charge		
Cars	£1.00	Free
2 Axle Goods	£1.75	Free
Multi Axle Goods	£3.20	Free

4.4 The reason for assuming “no change” in charging is a reasonable counterfactual against which to assess the impacts of the other options is that under the current Charging Order that applies to the Dartford Crossing, changes to the road user charges at the Dartford Crossing would only occur if a decision is specifically taken by the Secretary of State taking account of relevant considerations, to amend the rate of the charge in line with changes to the Retail Price Index. If no decision is made by the Secretary of State to alter the charges at the Dartford Crossing, the charges would remain at their present level in nominal terms. Since 2003 when the charges were first introduced, they have been changed only once because of concerns that multiple coin transactions resulting from increases in line with the retail price index would be likely to cause delays at the booths.

Policy option 1 – Increases in line with Retail Price Index (RPI) increases

4.5 The first policy option would see changes to the road user charging rates for the specific vehicle classes, varied on an annual basis in line with the increases in the Retail Price Index (RPI), as allowed by the current Charging Order. No other changes to the current charging regime are considered. The table below illustrates the levels of road user charges for this option over the appraisal period by applying the average annual RPI rate assumed in the transport model used (i.e. 2.63%) since 2009¹³. The cash charges have been rounded to the nearest 10p in accordance with the requirements of the existing Charging Order. This is in order to keep low the transaction costs resulting from the handling of multiple coins for cash payments. The proposed charges take account of the differential rates between different categories of vehicle as well as the differential discount rates for Dart-Tag users by category of vehicle.

¹³ Note – the current charges were introduced in 2008.

Road User Charges at the Dartford-Thurrock River Crossing increased in line with RPI

Proposed Day Charge (6am-10pm)					
Financial Year	2011	2012	2013	2014	2015
Motorbikes	Free	Free	Free	Free	Free
Cash charge					
Cars	£1.60	£1.60	£1.70	£1.70	£1.80
2 Axle Goods	£2.10	£2.20	£2.20	£2.30	£2.30
Multi Axle Goods	£3.90	£4.00	£4.10	£4.20	£4.30
Dart-Tag charge					
Cars	£1.07	£1.07	£1.13	£1.13	£1.20
2 Axle Goods	£1.84	£1.93	£1.93	£2.01	£2.01
Multi Axle Goods	£3.37	£3.46	£3.55	£3.63	£3.72

Policy option 2 – Increases in 2011/12 and 2012/13, followed by increases in line with the Retail Price Index (RPI)

4.6 Policy option 2 proposes a step change with specific increases to the charges in 2011 and 2012. In identifying the specific amounts proposed, the Department took into consideration potential benefits as well as public acceptability. For the remainder of the appraisal period, annual charge variations are made in line with RPI as allowed by the terms of the current Charging Order.

4.7 As with Policy Option 1, no other changes to the other elements of the charging regime are proposed. For example, times of operation of the existing charging regime are retained, and no other changes in terms of vehicle classifications and vehicle exemptions are contained within this policy option. The table below illustrates the road user charges for this option over the appraisal period. For 2011 and 2012 the cash rate for cars is increased from £1.50 to £2.00 and again to £2.50, while prices for other vehicles classes are increased proportionately. Cash charges are rounded to the nearest 50p in order to further reduce transaction costs associated with time taken to give change for cash payments. Rates for Dart-Tag users are then discounted at the present level of discount according to category of vehicle. From 2013 to 2015 annual variations are made by applying the average annual RPI rate assumed in the model used (i.e. 2.63%) to the 2012 rates of charges. The cash charges are again rounded to reduce transaction costs. The rates for Dart-Tag users were calculated by applying the differential discount rates by category of vehicle.

Road User Charges at the Dartford-Thurrock River Crossing step change increases

Proposed Day Charge (6am-10pm)					
	2011	2012	2013	2014	2015
Motorbikes	Free	Free	Free	Free	Free
Cash charge					
Cars	£2.00	£2.50	£2.60	£2.60	£2.70
2 Axle Goods	£2.50	£3.00	£3.10	£3.20	£3.20
Multi Axle Goods	£5.00	£6.00	£6.20	£6.30	£6.50
Dart-Tag charge					
Cars	£1.33	£1.67	£1.73	£1.73	£1.80
2 Axle Goods	£2.19	£2.63	£2.71	£2.80	£2.80
Multi Axle Goods	£4.33	£5.19	£5.36	£5.45	£5.62

5.0 Enforcement

5.1 The charging regime depends on barriers for enforcement. There is no regime of civil penalties. This arrangement is to be retained while the charging regime includes cash payments.

6.0 Groups and sectors affected

6.1 An outcome in which some road users benefit from an intervention while others are made worse off is one which is common to most road schemes, including schemes that do not involve road user charging. Congestion might increase on roads which provide access to an improved link, which relieves congestion on alternative routes. With a new road in place, each trip in the area affected experiences some faster sections of road and some which are slower, and the net effect depends on the combination of road links used by each trip, some of which make no use of the new link.

6.2 Detailed identification of those individuals who gain from a road transport intervention and those who are made worse off is generally not feasible in appraisal of road schemes. The reason for this can be illustrated via the following example. In the case of the Dartford Crossing a person travelling in the course of work might get a benefit in that the time savings exceed the additional charge. Yet that same person, having finished his or her work for the day, might experience a loss of benefit on the trip home because they put a lower value on saving non-working time. The traffic model is populated by the trips that people make and does not link individuals to these trips. This impact assessment presents costs and benefits for trips by journey purpose - for “businesses” and for “consumers” (non-business transport users) - with the purpose split based on data from surveys of households and road users. .

6.3 All road users who use the Crossing whether for business, commuting or leisure travel, will be affected by the proposals. Transport users who use the road network in the proximity of the Crossing may also be affected by changes to traffic flows on surrounding roads. Non-road users including local businesses and households would also be affected by any resulting changes to traffic flows, for example via the impact on transport related emissions of air pollutants and transport related noise to which business premises and households are exposed.

6.4 Given that the same individual may make journeys for very different purposes at different times of the day, the analysis in the following section distinguishes the potential impacts by vehicle type, journey purpose and length of journey.

6.5 Table B indicates the average annual usage of the Crossing by volume of chargeable vehicles by type (Cars, Heavy Goods Vehicles, Light Goods Vehicles and Motorcycles).

Table B. Annual traffic volumes of chargeable vehicles by vehicle class (Highways Agency, 2009/10)¹⁴

Cars	LGVs	HGVs	Motorcycles	TOTAL
33,644,109	6,702,135	4,721,919	341,019	45,409,182

6.6 The Department’s 2009 report on *Dartford River Crossing Study into Capacity Requirement* included data from the East of England transport model estimating the distribution between business and non-business trips for non-HGV traffic using the Dartford Crossing. Examination of this data shows that the split appears relatively consistent over different times of the day, with between 22-32% of trips using the Dartford Crossing for business purposes, namely trips made purely for work purpose in the course of a normal business day, excluding commuting to work.

6.7 The same report showed that only 5% of trips over the Crossing are less than 12 miles in length. Over 40% of trips over the Crossing are over 50 miles. This data illustrates the importance of the Crossing particularly for strategic movements of people and goods..

7.0 Source of the Evidence Base

¹⁴ Highways Agency advice, February 2011

Methodology for estimation of costs and benefits

7.1 The evidence presented in this impact assessment is drawn from application of transport modelling and appraisal techniques which are consistent with the Department for Transport's modelling and appraisal guidance. This guidance is referred to as WebTAG¹⁵. WebTAG provides guidance that is considered by the Department for Transport to represent best practice in transport modelling and appraisal. The WebTAG guidance reflects the evidence and knowledge base that has developed in this field over time. The guidance is fully consistent with the HM Treasury's Green Book, which sets out the principles expected for economic appraisal in Central Government¹⁶. The Department for Transport expects transport interventions requiring DfT approval to be assessed following WebTAG guidance, unless the promoter can provide justification acceptable to DfT for deviations from this guidance.

7.2 Transport models for road schemes comprise a complex range of iterative calculations to represent, at a simplified level, the numerous interactions that actually occur between vehicles on the road network and wider transport network. Transport models are developed to provide information to aid decision making, and enable consistent comparison between options.

7.3 Future year forecasts of traffic flows are generated from Temprow 5.4, which is a set of software and forecasts provided by the Department for Transport that are widely used for transport planning purposes¹⁷. Forecasts provided by Temprow¹⁸ include population, employment, households by car ownership, trip ends and simple traffic growth factors based on data from the National Transport Model (NTM). The National Transport Model (NTM), which is provided by the Department for Transport, provides a systematic means of comparing the national consequences of alternative national transport policies or widely-applied local transport policies, against a range of background scenarios which take into account the major factors affecting future patterns of travel.¹⁹ These forecasts are based on an analysis of people's travel behaviour and how the trips that they make, the distance that they travel and the modes that they use are likely to change over time. Modelling of traffic flows draws on evidence derived from time series analysis of the relationship between fuel costs, traffic volumes and other factors that affect the growth of road traffic.

7.4 The assessment of economic impacts of increasing charges at the Dartford Crossing was undertaken using the Department for Transport's TUBA (Transport Users Benefit Appraisal) software package. TUBA is a computer program developed for DfT to undertake economic appraisal for transport studies²⁰. The aim of TUBA is to carry out economic appraisals in accordance with the DfT's WebTAG transport appraisal guidance. TUBA software takes inputs that are generated by traffic models and undertakes economic appraisal calculations directly. The outputs from TUBA include calculation of changes in travel times and in vehicle operating costs. The use of TUBA ensures the correct and consistent use of appraisal parameters across all options and projects.

Modelling of charging options for the Dartford Crossing

7.5 The M25 Demand and Assignment Models, developed for the Department for Transport in accordance with WebTAG guidance, was used as the basis for modelling future year traffic with different road user charges at the Dartford Crossing. A number of modifications were made to the assignment model (which estimates the routes that road users will take between their origins and destinations) to enable more detailed representation of traffic behaviour at the Dartford Crossing and to represent travellers' sensitivity to charges.

7.6 The forecasts used in the M25 Traffic Model to estimate the change in number of trips between specific origins and destinations follow the principles used to derive the national forecasts, but reflect local, rather than national, factors in terms of, for example, congestion levels and population growth.

¹⁵ The WebTAG guidance is published at <http://www.dft.gov.uk/webtag/>

¹⁶ http://www.hm-treasury.gov.uk/data_greenbook_index.htm

¹⁷ Further information on Temprow is provided at <http://www.dft.gov.uk/temprow/>

¹⁸ Further information on the use of Temprow data is provided at <http://www.dft.gov.uk/webtag/documents/expert/pdf/unit3.15.2.pdf>

¹⁹ Further information on the National Transport Model is provided at <http://www.dft.gov.uk/pgr/economics/ntm/>

²⁰ Further information on TUBA is provided at

<http://webarchive.nationalarchives.gov.uk/+/http://www.dft.gov.uk/pgr/economics/software/tuba/tubausermanual.pdf>

7.7 The M25 Models were used to generate outputs that quantify traffic speeds, delays, queue lengths and emissions on the existing road network with future year traffic flows, both with or without the changes to the road user charges at the Dartford Crossing. As discussed above, the assessment of economic impacts was undertaken using the Department for Transport's TUBA software package, which presents the costs and benefits in monetary terms.

7.8 The traffic growth forecasts generated for this impact assessment are based on core traffic growth forecasts that were released in 2008 and are based on published economic projections at that time. They provide a sufficiently close approximation to the expected results that would be generated from use of more recent economic projections.

7.9 The Department's modelling and appraisal methods include an estimate of the cost incurred by those who re-route or chose a different destination and who are deterred by the effect of the increase in the charge less the travel time savings. Evidence on how road users respond to higher charges is derived from a range of studies, most of which have been based on the effects on traffic flows of fuel price changes. The analysis undertaken for this impact assessment indicates that the changes in congestion beyond the Dartford Crossing are complex. On road links to the crossing, speeds will be marginally higher because less traffic is using the crossing, while roads to which traffic diverts will be more congested. The assessment of costs and benefits takes these impacts into account.

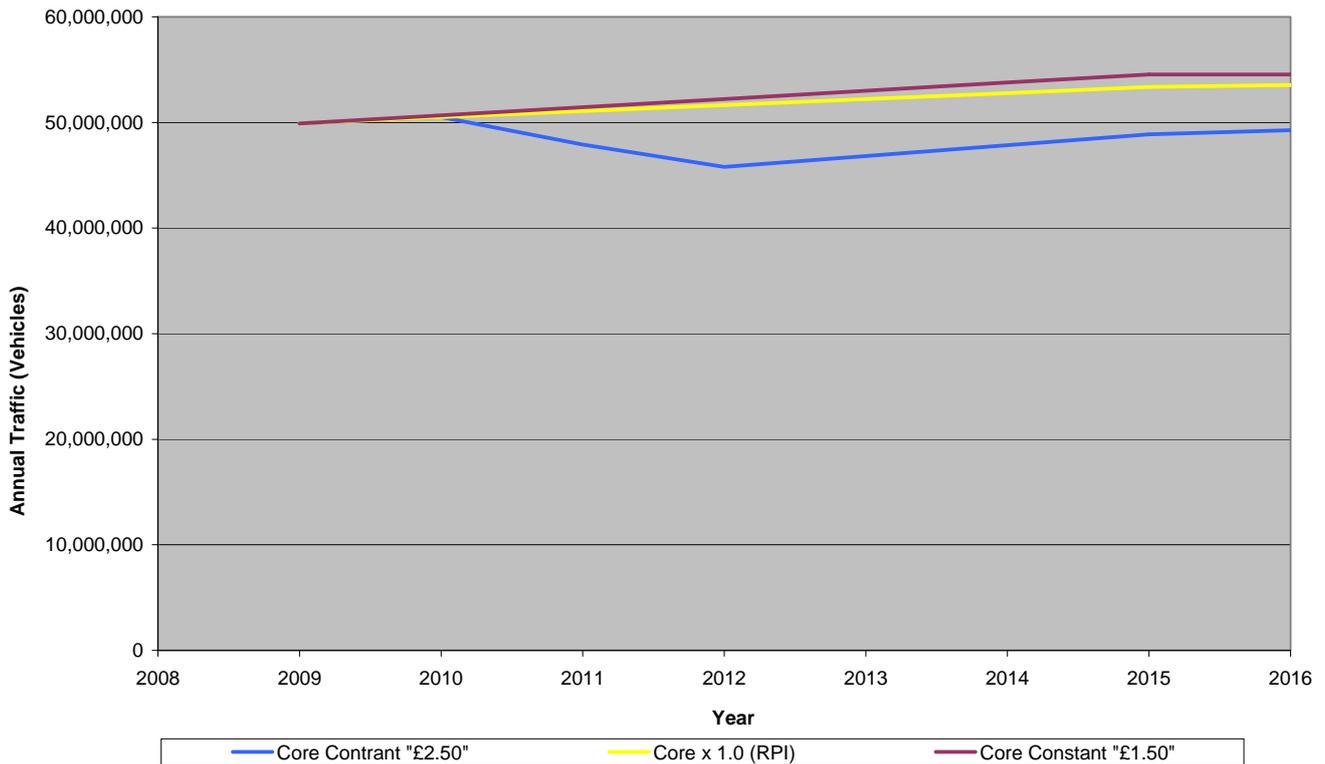
Impact of Options on Traffic Flows Across the Dartford Crossing

7.10 The immediate impact of the charge increase would be an increase in the out of pocket cost to transport users of journeys over the Crossing. Some current users of the Dartford Crossing would opt for alternative routes or destinations. However this, in turn, means that average journey times for journeys using the Crossing would be decreased. This reduction in average journey times would, by being reflected in a reduction in "generalised costs" of journeys, in turn increase the demand for use of the Crossing, worsening congestion and making the crossing less attractive again. The modelling undertaken for this Impact Assessment shows that these effects on demand would, via an iterative process eventually reach a stable equilibrium which reflects road users' responses to the combined effects of the higher charge and the reduction in journey times.

7.11 The economic effects of changing road user charges at the Dartford Crossing, including changes in travel times and vehicle operating costs, result from changes in travel patterns forecast by the traffic modelling that was undertaken for this impact assessment. In particular, the economic effects result from changes in routes chosen by transport users and in the changes in the level of congestion on the transport network. The resulting economic effects include direct changes in travel time and vehicle operating costs (including the crossing charges themselves), and the impacts of changes in carbon emissions, which depend on fuel consumption.

7.12 In view of the numerous different origins and destinations of vehicles using the Dartford Crossing, it is impossible to provide a robust and informative average per vehicle time savings. However, it is possible to illustrate the aggregate effect of increasing the charge on traffic volume. The chart below (figure 1) shows the modelled annual traffic flows across the Dartford Crossing resulting from the two policy options and the Do Nothing option, based on the transport modelling that was undertaken for this impact assessment. The "Core Constant - £1.50" line shows the estimated change in traffic crossing the Dartford Crossing if charges remain unchanged from their current rate. The "Corex1.0 (RPI)" line shows the estimated change if charges are increased in line with projected RPI. The "Core Constant - £2.50" line show the change if charges are increased to £2.50. The chart shows that increasing the charge would be expected to reduce the annual traffic flow across the Crossing.

Figure 1. Modelled Annual Traffic (Vehicles) by Policy Option



8.0 Costs and Benefits of policy options

Definitions

8.1 The definitions of costs and benefits in this impact assessment are consistent with the Department for Transport's transport appraisal guidance, referred to as WebTAG²¹. This guidance is fully consistent with the HM Treasury's guidance on appraisal and evaluation in central government (referred to as "The Greenbook") and confirmed as appropriate in the context of decisions regarding Department for Transport policies and projects. Following the requirements of the Department for Transport's (DfT) transport appraisal guidance, this impact assessment defines costs as costs to public finances. The objective in assessment of transport proposals is to maximise net benefits within the proportion of public finances allocated to transport expenditure. Therefore, all other impacts that do not directly impact public finances are defined as (either positive or negative) benefits.

Approach

8.2 This section reports the costs and benefits of the alternative policy options as estimated in aggregated monetary terms using the results of the modified M25 model appraised through TUBA.

8.3 Costs and benefits of each option were assessed in comparison with the Do Nothing option, and calculated over a 5 year appraisal period (from 2011 to 2015). The number of years until further changes are made to charges at the Dartford Crossing is not known. However, an appraisal period of 5 years was considered a reasonable time period over which these charging proposals could apply. It should be noted that, while altering the length of the appraisal period would alter the present value costs and benefits, and present value net benefits, of the options considered, it would not alter the relative rankings of the options in terms of these estimates.

8.4 A constant annual average increase of 2.63% was applied to the assumed charge for the Crossing throughout the appraisal period for Policy Option 1 and for the last 3 years of Policy Option 2,

²¹ Further information regarding definition of costs and benefits applied in this impact assessment, in the context of transport policy, is provided on pages 3 and 4 of "Transport Appraisal and the Green Book" (Department for Transport, 2010) at <http://www.dft.gov.uk/webtag/documents/project-manager/pdf/unit2.7.1d.pdf>

as the RPI rate assumed in the original model. This rate was applied because it was assumed in the model used, based on historic inflation rates over the recent time period considered by the analysis, and was close to the recent RPI increase forecasts. Policy option 2 involves two step changes in the Crossing charges. All monetised costs and benefits derived from the transport model were calculated by applying a factor of 1.5 to approximate the 2 step changes and subsequent increases in line with RPI, with adjustments applied for the charge increase in 2011.

8.5 The costs for the operation and maintenance of the current charging regime have been assumed to remain constant in real terms for each of the policy options assessed. Only additional operation and maintenance costs and benefits associated with each option have been analysed in calculating the costs and benefits of those options. Similarly with implementation costs, it is only those costs which are additional that are identified in the successive policy options. The additional costs comprise costs of increased staffing, signage and advertising.

8.6 All costs and benefits in the following sections are in 2002 prices discounted to 2002. The use of a 2002 price base year is in accordance with the Department for Transport's transport appraisal guidance, and is the base year for all transport appraisals that require Department for Transport approval. The use of a consistent base year for transport appraisals enables consistent comparison between alternative transport schemes and options.

Values and calculations applied

8.7 Benefits are mainly identified in terms of

- change in travel time for journeys using the Dartford Crossing and in the surrounding area, and
- change in vehicle operating costs for these journeys.

Detailed explanation of the values and formulas applied to derive these benefits is provided in the Department for Transport's WebTAG guidance, with which the model and software used for this impact assessment complies. Detailed explanation of the values of travel time savings and vehicle operating costs are provided in *TAG Unit 3.5.6 Values of Time and Operating Costs*²².

Travel time savings

8.8 As the WebTAG guidance indicates, the Department for Transport has undertaken a long term programme of research to identify the appropriate values to apply in calculating travel time savings. Time spent travelling during the working day is a cost to the employer's business. It is assumed that savings in travel time convert non-productive time to productive use and that, in a free labour market, the value of an individual's working time to the economy is reflected in the wage rate paid. This benefit is assumed to be passed into the wider economy and to accrue in some proportion to the producer, the consumer and the employee, depending on market conditions. The majority of journeys do not take place during working hours, but in the traveller's own time. However, people implicitly put a value on their own time, in that they will trade a cheaper, slower journey against a faster, more expensive one. It is therefore appropriate to take account of this value in assessing the impact of different transport policies.

8.9 The WebTAG guidance reports that the average value for travel time savings in business time is estimated to be £26.73 per hour. The average value for travel time savings in non-working time is estimated to be £5.04 for commuting journeys and £4.46 for other journeys in non-working time. These values are in market prices, at 2002 prices and values.

Vehicle Operating Costs

8.10 Driving vehicles on the road system gives rise to operating costs for the user. The Department for Transport has developed formulas to estimate the impact of transport policies on these costs. For example, they include the cost of fuel, oil and tyres, and an element of vehicle maintenance. The formulas for car and goods vehicle operating costs also include allowances for the purchase of new vehicles. The distance-related costs to private households and business of purchasing a car are included by making an allowance for mileage related depreciation. In addition, an allowance is also made in relation to business cars, for the decline in vehicle capital value (other than that accounted for by mileage related depreciation). The costs to freight carriers of goods vehicle purchases are taken into account under goods vehicle non-fuel operating costs. As with private cars, it is assumed that the decision to purchase goods vehicles is independent of the transport policy option pursued. However,

²² This is available at <http://live-webtag.dft.gov.uk/documents/expert/pdf/unit3.5.6d.pdf>

changes in congestion on the road system will influence the productivity of any given fleet of goods vehicles, and this element is taken into account in calculating goods vehicle operating costs.

8.11 The formulas used by the Department for Transport for calculating changes in vehicle operating costs are also used in transport modelling to estimate changes in fuel consumption and the associated change in fuel duty revenue from changes in transport policies. These formulas also underpin the calculation of the impact of charge increases on fuel duty revenue in this impact assessment.

Costs and Benefit Assessment of Policy Option 1

Costs

8.12 The estimated investment costs to Government arising in the implementation of Policy Option 1 are valued at £0.7m over the appraisal period. These relate to the physical implementation of the necessary changes for the revised charging regime, in terms of amended signage for motorists on the approaches and at the Dartford Crossing, changes to the marketing and publicity material for the charging scheme, as well as amendments necessary to the software systems used to manage the pre-paid accounts of users paying in advance.

8.13 There are some additional, on-going operational costs of the revised charging regime during the appraisal period estimated at £1.1m as a result of the need to manage a potential increase in the numbers of pre-paid accounts for the Crossing charge, and the need to effectively manage multi-coin based transactions.

8.14 In addition, to the investment and operational costs, the Government also incur costs in terms of decreases in indirect tax revenues because of reductions in traffic, and the implications in terms of reduced fuel duty and vehicle excise duty estimated at £4.3m .

8.15 However, the Government gains from additional revenues received from the payment of increased Crossing charges. In this policy option, the increased revenues during the appraisal period are estimated at £20.5m.

Table C: Costs of Policy Option 1

Description of Cost	Amount (£ million) (present value over appraisal period)
Investment cost to government	£0.7
Ongoing operational costs	£1.1
Indirect tax revenue	£4.3
Revenues from Crossing charges	- £20.5
TOTAL	-£14.4

Benefits

8.16 In terms of benefits, Policy Option 1 provides benefits to both consumer and business journeys in terms of improvements in travel time, with consumers estimated to benefit by £9.8m and businesses estimated to benefit by £27.9m. There are also estimated benefits to both in terms of reduced vehicle operating costs; consumers benefiting by £2.3m and businesses by £1.1m over the appraisal period.

8.17 However, these estimated benefits are reduced by increased user charges to consumers and businesses, with consumers facing an increase in charges of £8.5m and businesses facing an increase in charges of £13.9m delivering overall benefits of £3.6m and £15.1 m to consumers and businesses respectively.

8.18 In addition, there is a slight increase in greenhouse gas emissions of +0.001million tonnes CO2 equivalent resulting from a small increase in vehicle miles of around 0.01% on the network. The increase in carbon emissions is valued at -£0.15m.

8.19 In terms of wider non-monetised impacts, such as air quality and noise levels, there is no discernible change as a result of this option.

Table D: Benefits of Policy Option 1

Description of Benefit	Amount (£ million) (present value over appraisal period)
Benefits to consumers	
Travel time savings	£9.8
Vehicle operating costs	£2.3
User charges	-£8.5
Total benefit to consumers	£3.6
Benefits to businesses	
Travel time savings	£27.9
Vehicle operating costs	£1.1
User charges	-£13.9
Total benefit to businesses	£15.1
Carbon emissions	-£0.15
TOTAL	£18.55

Costs and Benefit Assessment of Policy Option 2

Costs

8.20 The estimated investment costs to Government arising from the implementation of Policy Option 2 are valued at £0.9m over the appraisal period. They relate to the physical implementation of the necessary changes for the revised charging regime, in terms of further amended signage for motorists on the approaches and at the Dartford Crossing, as well as amendments necessary to the software systems used to manage the pre-paid accounts of users paying in advance. These are slightly higher than the investment costs for policy option 1 to reflect the need for additional signage and advertising to communicate the scale of increase.

8.21 As for policy option 1, there are also some additional, on-going operational costs of the revised charging regime during the appraisal period estimated at £1.5m resulting from the need to manage a potential increase in the numbers of pre-paid accounts for the Crossing charge, and the need to effectively manage multi-coin based transactions.

8.22 The Government also incurs additional costs estimated at £22.8m in terms of decreases in indirect tax revenues as, with the forecast reductions in traffic and in congestion, purchases of highly taxed fuel fall. .

8.23 However, the Government gains from increased revenues received from the payment of increased Crossing charges estimated at £-99.3m. This is almost £79m more than would be gained as a result of policy option 1. The overall effect is an increase in Government revenues of £74.1m

Table E: Costs of Policy Option 2

Description of Cost	Amount (£ million) (present value over appraisal period)
Investment cost to government	£0.9
Ongoing operational costs	£1.5
Indirect tax revenue	£22.8
Revenues from Crossing charges	-£99.3
TOTAL	-£74.1

Benefits

8.24 In terms of benefits, Policy Option 2 provides benefits to both consumers and businesses in terms of further improvements in travel time, with consumers estimated to benefit by £38.4m and businesses estimated to benefit by £110.1m. There are also estimated benefits to both in terms of reduced vehicle operating costs – with consumers benefiting additionally by £12.1m and businesses by £1.2m, over the appraisal period.

8.25 The estimated benefits are reduced because consumers pay increased user charges of £43.0m and businesses pay increased user charges of £77.0m.

8.26 There are some additional benefits from a reduction in greenhouse gas emissions of - 0.001million tonnes CO2 equivalent associated with a small decrease in fuel consumption of around 0.05% on the network. The reduction in carbon emissions is valued at £1.5m.

8.27 In terms of wider non-monetised impacts, such as air quality and noise levels, there is no discernible change as a result of this option.

Table F: Benefits of Policy Option 2

Description of Benefit	Amount (£ million) (present value over appraisal period)
Benefits to consumers	
Travel time savings	£38.4
Vehicle operating costs	£12.1
User charges	-£43.0
Total benefit to consumers	£7.5
Benefits to businesses	
Travel time savings	£110.1
Vehicle operating costs	£1.2
User charges	-£77.0
Total benefit to businesses	£34.3
Carbon emissions	£1.5
TOTAL	£43.3

9.0 Distributional aspects

9.1 The benefits from each respective policy option appear to be occurring in the adjacent counties of Kent and Essex and the outer London areas, as well as further parts of the south east and east of England. This is a reflection of the strategic role of the Crossing and its importance particularly for the economies of London and the south east and east of England.

9.2 Whether specific individual road users continue to use the Crossing would depend largely on the value that they place on the reduction in journey times. Road users with per vehicle value of time, for the reduced journey time, that is lower than the additional charge would experience an overall cost, while other road users would benefit because the time savings are worth more to them than the additional charge.

9.3 Detailed identification of those individuals who gain from a road transport intervention and those who are made worse off is generally not feasible in the appraisal of road schemes. For example, a person travelling in the course of work might obtain a benefit in that the time savings exceed the additional charge. Yet that same person, travelling in non-working time, might experience a loss of benefit because they put a lower value on saving non-working time. The traffic model is populated by the trips that people make and does not link individuals to these trips. As identified previously in this impact assessment, the analysis presented identifies costs and benefits for trips by journey purpose - for “businesses” and for “consumers” (non-business transport users) – with the purpose split based on data from surveys of households and road users.

10.0 Administrative burden and policy savings

10.1 We expect more users to use the DART-tag system in future as a result of the discounts offered. It is, however, uncertain how many will choose to transfer to the DART-tag system. Registering to use an

automatic payment scheme will incur some one-off administrative costs for such users. There will be administrative cost to Government in the procurement and issuing of new tags, which would be incurred under current terms and conditions. There will be some additional costing managing the increased DART-tag accounts.

11.0 Risks and assumptions

Risks

11.1 There are risks that traffic growth does not match traffic growth projections calculated and applied in estimation of the costs and benefits presented in the impact assessment, particularly due to uncertainty about external variables including future rates of economic growth.

Assumptions

11.2 In appraising the policy options on a consistent comparable basis using the M25 Traffic Model and the DfT's TUBA programme were used, as explained previously in this impact assessment. In undertaking this analysis, the following assumptions were made:

- The respective Crossing charge rates are assumed to apply to full calendar years.
- The rate of change based on the Retail Price Index (RPI) was assumed at a constant annual average rate of 2.63%. This was derived on the basis of historic RPI inflation from 2004 (the M25 model base year) to 2009 (when the M25 model was configured for the Lower Thames Crossing option analysis). At that time this was a reasonable forward projection to use – the present inflationary pressures were not then evident
- The step change increases in policy option 2 were approximated using the results of the model runs based on a charge ratio factor of 1.5 (with respect to current charge levels) over the 5 year period. For 2011, when the charge will be approximately half-way between the 1.0 and 1.5 x current charge model runs, a commensurate benefit adjustment was assumed. In other words, it was assumed charges would increase by 150% over the appraisal period, but that part of the step change in charges would be implemented in 2011 and part would be implemented in 2012.
- The number of vehicles and the charge paid by users for the Dart-Tag discount scheme are based on estimates of the current situation, and were assumed to remain constant over the appraisal period.
- The economic forecasts are derived from the Department for Transport transport appraisal programme (referred to as TUBA version 1.7c) without alteration to any of the economic parameters. This was in accordance with the Department for Transport's modelling and appraisal guidance (referred to as WebTAG)
- The traffic growth forecasts are based on a Department for Transport programme that is widely used by the Department for estimating traffic growth. This programme is referred to as TEMPRO, and version 5.4 was used, which is the latest published version advised for use by Department for Transport modelling and appraisal guidance.
- The percentages of the total number of user journeys at the Crossing which were for business purposes and those which were for other trips (consumers), were assumed to change over the appraisal period in line with the forecasts from the M25 Traffic Demand Model.

12.0 Direct costs and benefits to business calculations (following OIOO methodology)

12.1 The proposed measure relates to the increase of an existing charge. The charge was introduced in 2003 for the purpose of managing demand at the Dartford Crossing and the revenue receipts have been used as stipulated in the Transport Act 2000 for transport investment. This measure is considered to be in scope of the 'One In One Out' rule whereby any new regulatory cost is, at least, matched by cuts to the cost of existing regulations. However, the measure would result in a net benefit to business therefore no compensatory measure need be identified.

13.0 Summary and preferred option with description of implementation plan.

Summary Assessment

13.1 The two policy options are each shown to provide benefits to both consumers and businesses in terms of improved travel time and reduced vehicle operating costs. These benefits are reduced by increased user charges to consumers and businesses. However, the increased user charges also represent increased revenue to Government. The net benefit of both options remains positive because, on average, road users place a higher money value on the time savings than they place on the additional charge. There will be some road users who do not value the time savings by as much as the charge increase. A proportion of these will stop using the Crossing and thereby deliver the reduction in congestion that results in time savings for the majority who continue to use the crossing.

13.2 The present value net benefit gained through policy option 1 is valued at £32.9m over the appraisal period, while the present value net benefit gained through policy option 2 is valued at £117.4m over the appraisal period..

13.3 In terms of carbon emissions, policy option 1 demonstrates a slight increase in emissions, while policy option 2 demonstrates a slight reduction in carbon emissions.

Preferred Option

13.4 The preferred option is policy option 2. The benefits in terms of improved travel time resulting from policy option 2 are greater than those secured by policy option 1 (i.e. an annual average of £29.7m compared with £7.5m). Similarly the increased revenue secured as a result of policy option 2 is greater than that for policy option 1 (i.e. an annual average of £19.9m compared with £4.1m).

13.5 In addition, policy option 2 is shown to result in a slight reduction in carbon emissions while policy option 1 is shown to be accompanied by a slight increase in emissions.

13.6 Therefore, of the two options, policy option 2 is estimated to deliver the larger present value net benefit, and is estimated to more closely achieve both policy objectives identified in this impact assessment.

Implementation Plan

13.7 Changes to the charging regime at the Crossing are made using secondary legislation (an Order) which is subject to a period of statutory consultation. Subject to the outcomes of the consultation process, the Department for Transport would finalise the Charging Order (a draft copy of which would be included in the consultation documents).

13.8 In addition, a detailed implementation plan would be developed with the Highways Agency and the current operator of the Dartford-Thurrock River Crossing, to provide the necessary amendments to the Crossing charge collection process including installing new signage, advertising the new rates and making requisite software changes.

Annexes

Annex 1 should be used to set out the Post Implementation Review Plan as detailed below. Further annexes may be added where the Specific Impact Tests yield information relevant to an overall understanding of policy options.

ANNEX 1: POST IMPLEMENTATION REVIEW (PIR) PLAN

A PIR should be undertaken, usually three to five years after implementation of the policy, but exceptionally a longer period may be more appropriate. If the policy is subject to a sunset clause, the review should be carried out sufficiently early that any renewal or amendment to legislation can be enacted before the expiry date. A PIR should examine the extent to which the implemented regulations have achieved their objectives, assess their costs and benefits and identify whether they are having any unintended consequences. Please set out the PIR Plan as detailed below. If there is no plan to do a PIR please provide reasons below.

<p>Basis of the review: [The basis of the review could be statutory (forming part of the legislation), i.e. a sunset clause or a duty to review, or there could be a political commitment to review (PIR)]; Spending Review commitment to introduce the use of newer technology in the collecting of charges.</p>
<p>Review objective: [Is it intended as a proportionate check that regulation is operating as expected to tackle the problem of concern?; or as a wider exploration of the policy approach taken?; or as a link from policy objective to outcome?] Review is intended to be a proportionate check of the appropriateness of the charging levels in the context of the introduction of newer technology for collecting charges.</p>
<p>Review approach and rationale: [e.g. describe here the review approach (in-depth evaluation, scope review of monitoring data, scan of stakeholder views, etc.) and the rationale that made choosing such an approach] Review level of Crossing charges in context of the introduction of newer technology.</p>
<p>Baseline: [The current (baseline) position against which the change introduced by the legislation can be measured] 2009/10 levels of congestion, traffic volumes and road user charges collected.</p>
<p>Success criteria: [Criteria showing achievement of the policy objectives as set out in the final impact assessment; criteria for modifying or replacing the policy if it does not achieve its objectives] Reduced congestion levels and additional revenue generated.</p>
<p>Monitoring information arrangements: [Provide further details of the planned/existing arrangements in place that will allow a systematic collection of monitoring information for future policy review] Ongoing monitoring by Highways Agency of delay data and revenue and by the Crossing operator of traffic flow data through the Crossing.</p>
<p>Reasons for not planning a review: [If there is no plan to do a PIR please provide reasons here] N/A</p>

ANNEX 2: SPECIFIC IMPACT TESTS

Statutory Equality Duties

As both the existing and proposed charges apply according to the category of vehicle rather than driver, (with exception of vehicles being used, or kept for use, by or for the purposes of a disabled person, which are exempt), there are not expected to be any direct impacts on the protected equality groups from the proposals. As part of the consultation process we will be taking views from stakeholders.

Small Firms Impact Test

The proposed measure imposes no new regulatory burden on small firms as the charges already exist. The existing and proposed charges apply according to category of vehicle rather than driver. There is nevertheless some evidence from business users of the importance of the Crossing and concerns about congestion levels and existing charge collection arrangements. As part of the consultation process we will be taking views from stakeholders including small firms, which may be affected by congestion at the Crossing and the proposed price increases.

ANNEX 3 – FURTHER EXPLANATION OF TRANSPORT MODELLING METHODOLOGY APPLIED IN THIS IMPACT ASSESSMENT

All traffic and travel demand modelling for this Impact Assessment was conducted in accordance with the Department for Transport's WebTAG analysis guidance. Results from a programme of Post-Opening Project Evaluations (POPE) of Highways Agency road constructions demonstrate that models produced in accordance with our modelling guidance provide reliable predictions of traffic flows and benefits.

The expected change in traffic routing in response to the change in levels of toll charges was forecast by means of Wardrop's User Equilibrium Principle. This states that traffic uses only minimum cost routes, where "cost" means a linear combination of journey time, charges and vehicle operating costs. The journey time depends on the amount of traffic encountered, which in turn depends on the routing choice of that traffic. Thus the minimum cost routes must be found by an iterative process using software.

The software used in this case was the SATURN transport modelling package. SATURN models interactions at junctions using a mixture of queuing theory, signal simulation and gap acceptance parameters to estimate delays. Where junctions are not modelled, delays are estimated with reference to Government standard speed-flow relationships as set out in the Design Manual for Roads and Bridges.

Minimum cost routes across the network are calculated by Dijkstra's algorithm. Wardrop's User Equilibrium Principle is treated as a linearly constrained optimization problem, using Beckman's formulation. The optimization problem is solved by the Frank-Wolfe algorithm with the descent direction at each iteration given by the current minimum route cost set.

The road network is represented as a weighted di-graph. The modelled network is defined so as to cover a wide enough area to capture all significant re-routing. The journey time, vehicle operating cost and charge impacts of avoiding the crossing are therefore captured within the modelling. Vehicle operating costs were calculated using the Department for Transport's standard WebTAG relationships.

To ensure that travel on the supply network is in balance with travel costs, the travel demand is input into a model that calculates the responses to changes in travel cost, in particular trip frequency, mode choice and trip distribution. In the case of the Highways Agency's M25 Demand Model (M25DM) this uses the EMME/3 software package. For a future year forecast the model takes the projected increase in demand for travel at current cost (the reference case) and assigns it to the network to ascertain the change in travel cost. The reference case demand and travel cost is then entered into the demand model to determine the projected responses and the supply and demand models iterated until convergence. The principal response is trip distribution which is calculated by a zone-based hierarchical multinomial logit model that has been calibrated to study area-wide elasticities of demand to changes in travel cost in accordance with WebTAG guidance. Zone-to-zone journey times are calculated using an internal highway network model, analogous to the SATURN highway model, but using a less detailed network representation for modelling efficiency. When the demand modelling is in balance, the resulting travel matrix is

passed back to the SATURN model to determine the resulting traffic flows on its more detailed highway network.

Forecast levels of the demand for travel within the models are controlled to match the Department for Transport's National Trip-End Model data-set. The current definitive version, used for this modelling, is version 5.4. A new data-set based on the Budget 2011 OBR forecasts is in preparation but is not yet available for use, and could only be included within the modelling at disproportionate cost.

EMISSIONS CHANGES FOR POLICY OPTION 2 (preferred option)

ANNEX 4

[Note: This option represents a reduction in greenhouse gas emissions when compared with the 'Do Nothing' baseline, of -0.001million tonnes CO2 equivalent associated with a small decrease in vehicle mileage of around 0.05% on the network]

Version of GHG guidance used:		e.g. March 2010												
Sector		Emission Changes* (MtCO2e) By Budget Period			Emission Changes (MtCO2e) Annual Projections									
		CB I; 2008-2012	CB II; 2013-2017	CB III; 2018-2022	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Power sector	Traded	0	0	0										
	Non-traded	0	0	0										
Transport	Traded	0	0	0										
	Non-traded	8682.5	15630	0				2979	5704	5454	5209	4967		
Workplaces & Industry	Traded	0	0	0										
	Non-traded	0	0	0										
Homes	Traded	0	0	0										
	Non-traded	0	0	0										
Waste	Traded	0	0	0										
	Non-traded	0	0	0										
Agriculture	Traded	0	0	0										
	Non-traded	0	0	0										
Public	Traded	0	0	0										
	Non-traded	0	0	0										
Total	Traded	0	0	0	0	0	0	0	0	0	0	0	0	0
	Non-traded	8682.5	15630	0	0	0	0	2979	5704	5454	5209	4967	0	0
Cost effectiveness	% of lifetime emissions below traded cost comparator													
	% of lifetime emissions below non-traded cost comparator													

* Important note: Please enter net emission savings as positive numbers and net emission increases as negative numbers.