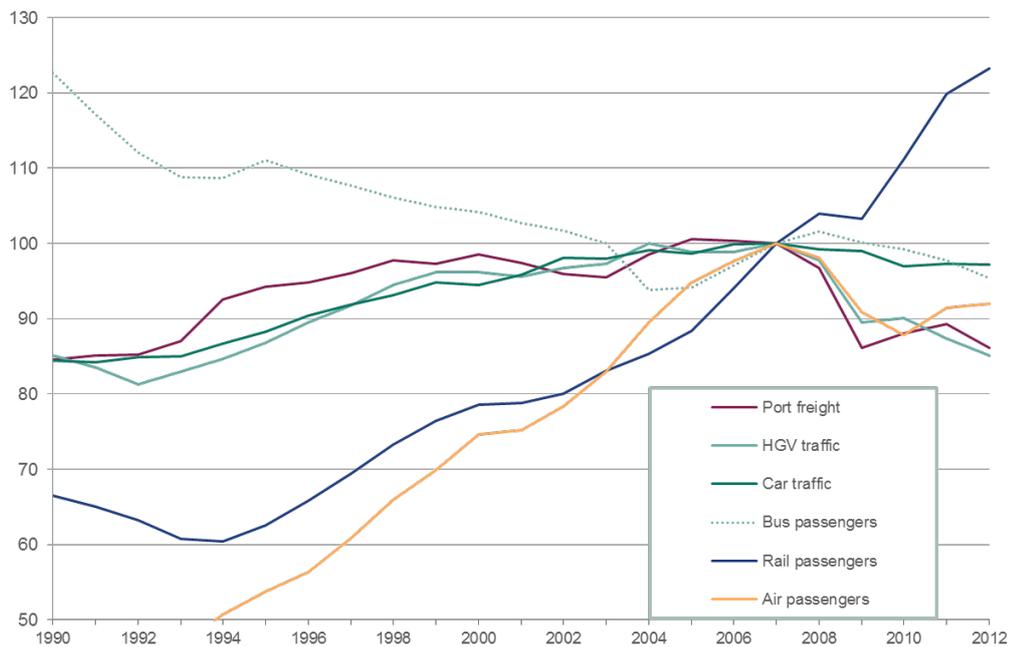


The Transport Economist

The Journal of the Transport Economists' Group



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Funding and financing of Crossrail 2

Scott Clyne

Arup

25 March 2012

Introduction

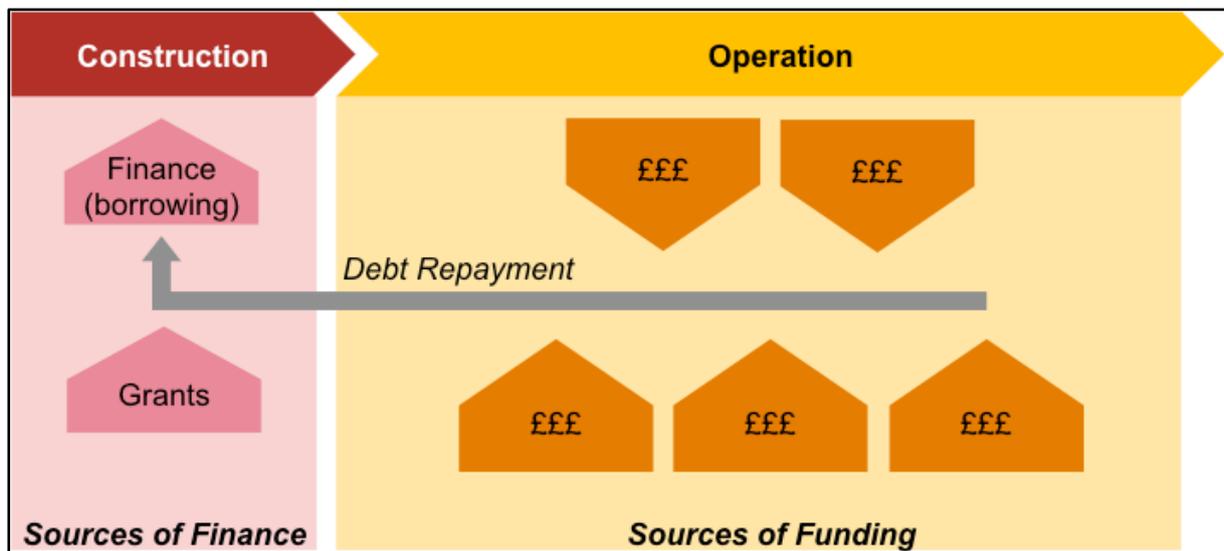
Scott began by explaining that Crossrail 2 would address the pressures of rising population and employment in London.

In February 2013 the Crossrail 2 Task Force, supported by business in London and Lord Adonis, reported. In June 2013 Danny Alexander, Chief Secretary to the Treasury, said

“The challenge for the Mayor of London now is to determine how at least half of the cost of the scheme can be met through private sources, ensuring that it will be affordable to the UK taxpayer”.

This was the quid pro quo for £2 million of funding to Transport for London (TfL) to develop the scheme further.

Figure 2: Crossrail 2 funding and financing



PwC was brought in to look at funding, including forecasting first the scheme cost profile and then what could be generated by various funding mechanisms. He stressed that the emphasis of the PwC report was funding, rather than financing, which could be resolved nearer the time.

Scott would speak about what Crossrail 2 is, how much it will cost, how it can be paid for, and how it be financed.

What is Crossrail 2?

Figure 1: Crossrail 2 route safeguarded as of 23 March 2015

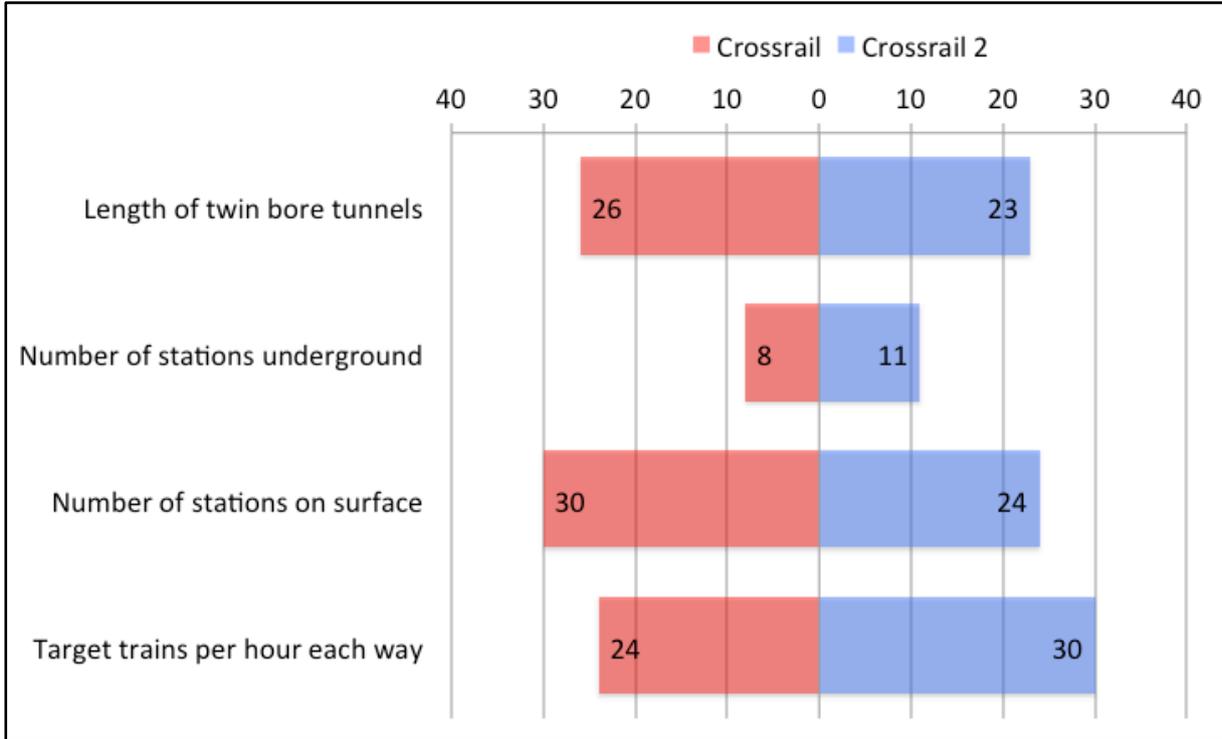


Crossrail 2, shown in Figure 1, began as the Chelsea-Hackney Line, but the primary routing had been moved from Hackney to serve the Lea Valley north of Tottenham Hale to facilitate regeneration and new housing, and the proposals had been changed from freestanding “tube” to a more integrated heavy rail operation. The line will have a number of effects:

- Relieving Waterloo: even if more trains could be operated into the terminus, the onward connections by Underground could not cope
- Relieving the Piccadilly and Victoria Lines
- Dispersal for HS2 at Euston

Crossrail 2 would have 250 metre trains and fares would be integrated with TfL zonal fares. If better signalling allows 30 trains per hour each way, as shown in Figure 3, capacity would be around 45,000 passengers per hour each way.

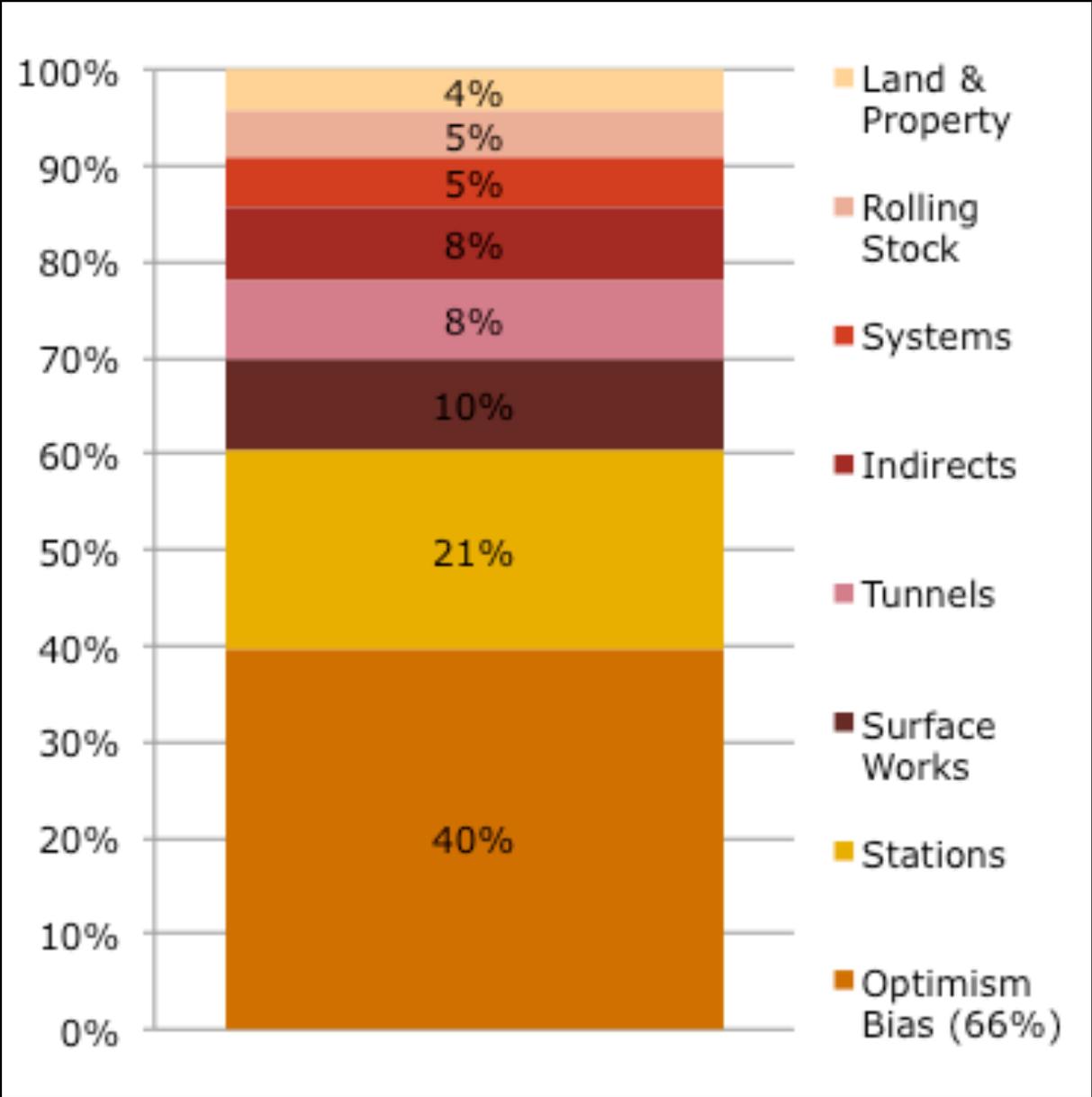
Figure 3: Crossrail and Crossrail 2 compared



How much will Crossrail 2 cost?

Capital cost estimates developed by Mott MacDonald total £27.5 billion including rolling stock and 66% Optimism Bias, as summarised in Figure 4.

Figure 4: Crossrail 2's projected costs of £27.5 billion

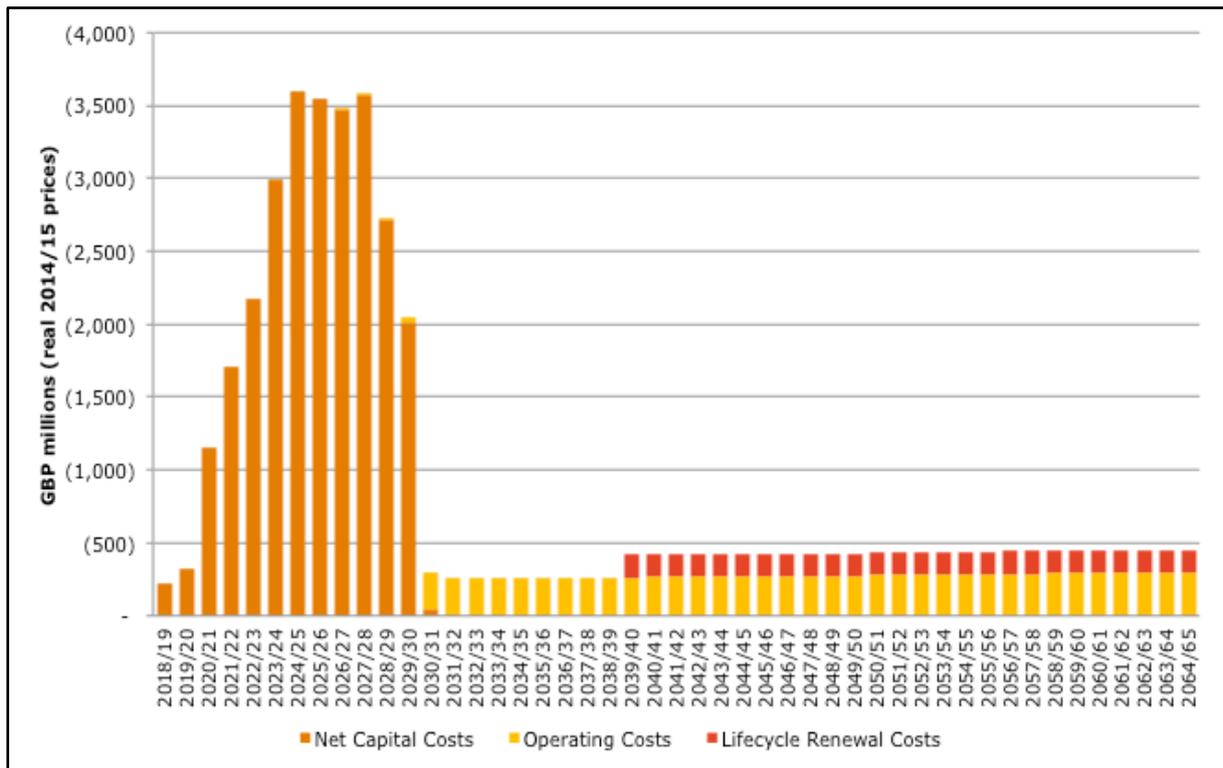


This £27.5 billion compares with £15.8 billion for Crossrail and £45.3 billion for HS2, on slightly different price bases.

21% of costs relate to underground stations and 10% to surface works including surface stations. Only 8% of the total cost relates to tunnelling.

CH2M Hill had provided estimates of operating costs of around £230 million per annum over a 35-year period. Provision had been made for £150 million per annum renewal costs, including extending trains from 10-car to 12-car after ten years of operation, as shown in Figure 5.

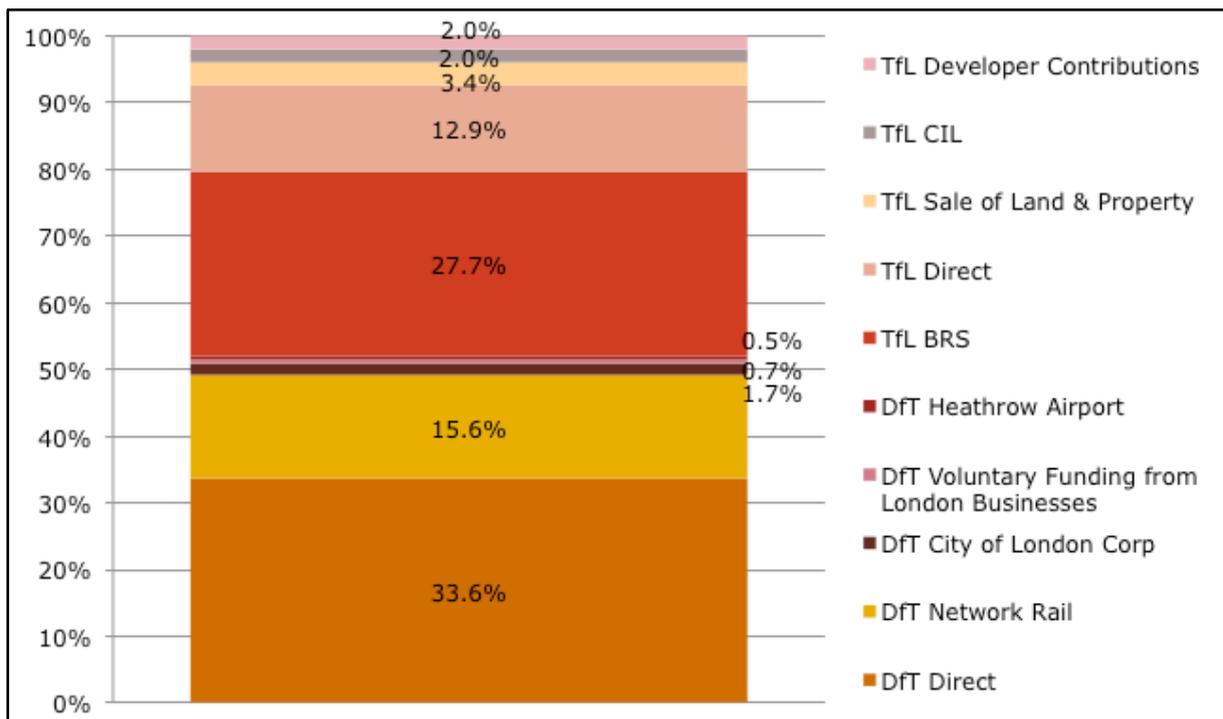
Figure 5: Crossrail 2 lifetime cost profile



How can Crossrail 2 be paid for?

Scott began by setting out the funding for Crossrail, shown in Figure 6.

Figure 6: Crossrail funding sources



Elements of funding include:

- TfL BRS: the Business Rate Supplement (BRS)
- TfL direct: ticket revenue from passengers
- TfL CIL: the Community Infrastructure Levy per square metre of new development
- TfL developer contributions, from businesses such as Canary Wharf and a contribution by Heathrow Airport which the CAA will allow it to recover from charges

This last category of contributions negotiated with the private sector represents only 2% of the costs, compared with the 50% aspired to by Danny Alexander.

Scott outlined the “beneficiary pays” principle and identified four main groups of beneficiary:

- Passengers on Crossrail 2
- Passengers on other services benefitting from released capacity
- Employers benefitting from access to a wider labour pool
- Owners of commercial or residential property along the route

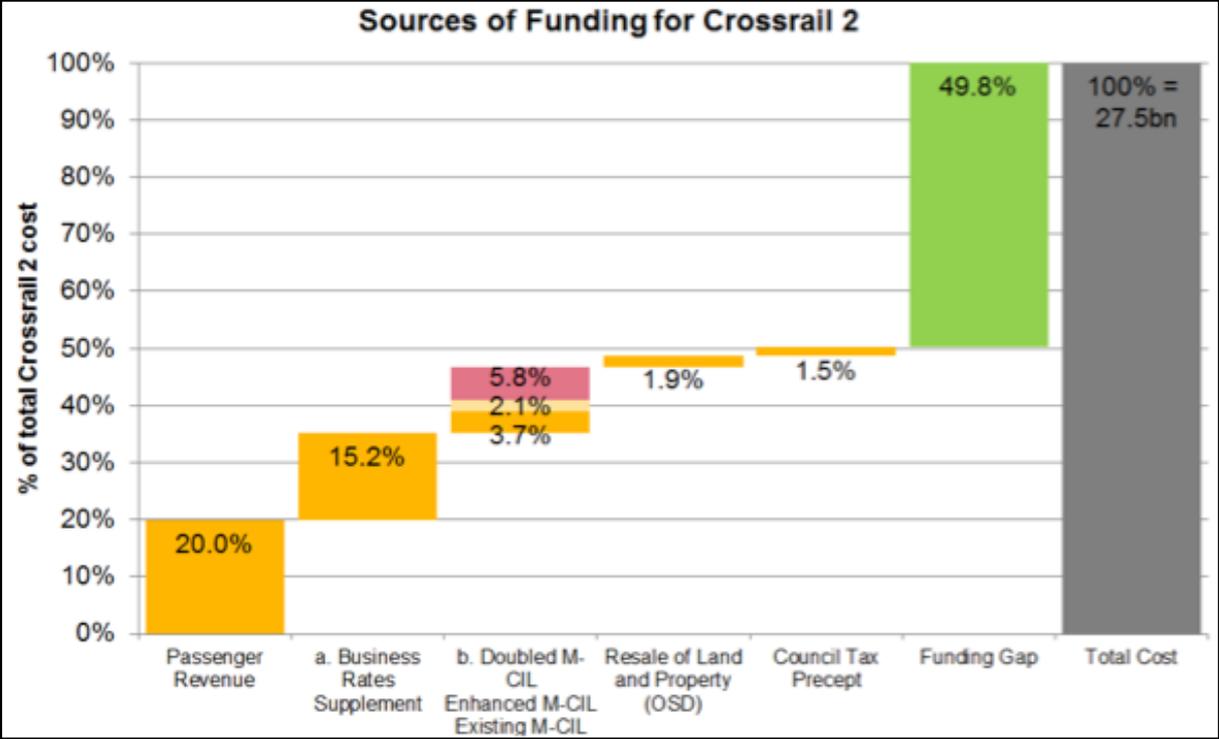
Table 1 indicates whether and how potential funding approaches target these beneficiaries.

Table 1: Funding sources and “beneficiary pays”

	Crossrail 2 passengers	Other TfL passengers	London employers	Property owners
Farebox	✓	✓	x	x
Business Rate Supplement	x	x	✓	✓
Mayoral Community Infrastructure Levy	x	x	x	✓
Resale of land and property	x	x	x	✓
Council Tax precept	x	x	x	✓
Government grant	x	x	x	x

Figure 7 sets out the funding package presented in the PwC study, including a Council Tax Precept used for the Olympics.

Figure 7: Crossrail 2 possible funding package



The various elements of the package are discussed further below.

Farebox

Assuming a fares policy of RPI+1% to 2021 and RPI+0.5% thereafter, net farebox revenue would cover around 20% of the costs, compared with 12.9% projected for Crossrail (Figure 6).

Business Rates Supplement (BRS)

While it appears politically possible to capture value from some types of property, further taxes on existing residential property are politically difficult, as Scott illustrated with Table 2.

A Business Rates Supplement of 2p in the pound rateable value (2%) for all “hereditaments” of over £55,000 rateable value would apply to all of London. However, income would only be available to Crossrail 2 after the Crossrail loan has been repaid around 2033.

Table 2: the pitfalls of property value capture

	Existing property	New property
Commercial	Business Rates Supplement (BRS)	Mayoral Community Infrastructure Levy (MCIL)
Residential	Council Tax Precept 	

Mayoral Community Infrastructure Levy (MCIL)

Figure 8 shows the existing MCIL based on zones with different rates, which would recover around 6%. MCIL would be indexed with tender prices.

Figure 8: Mayoral Community Infrastructure Levy (MCIL) zones

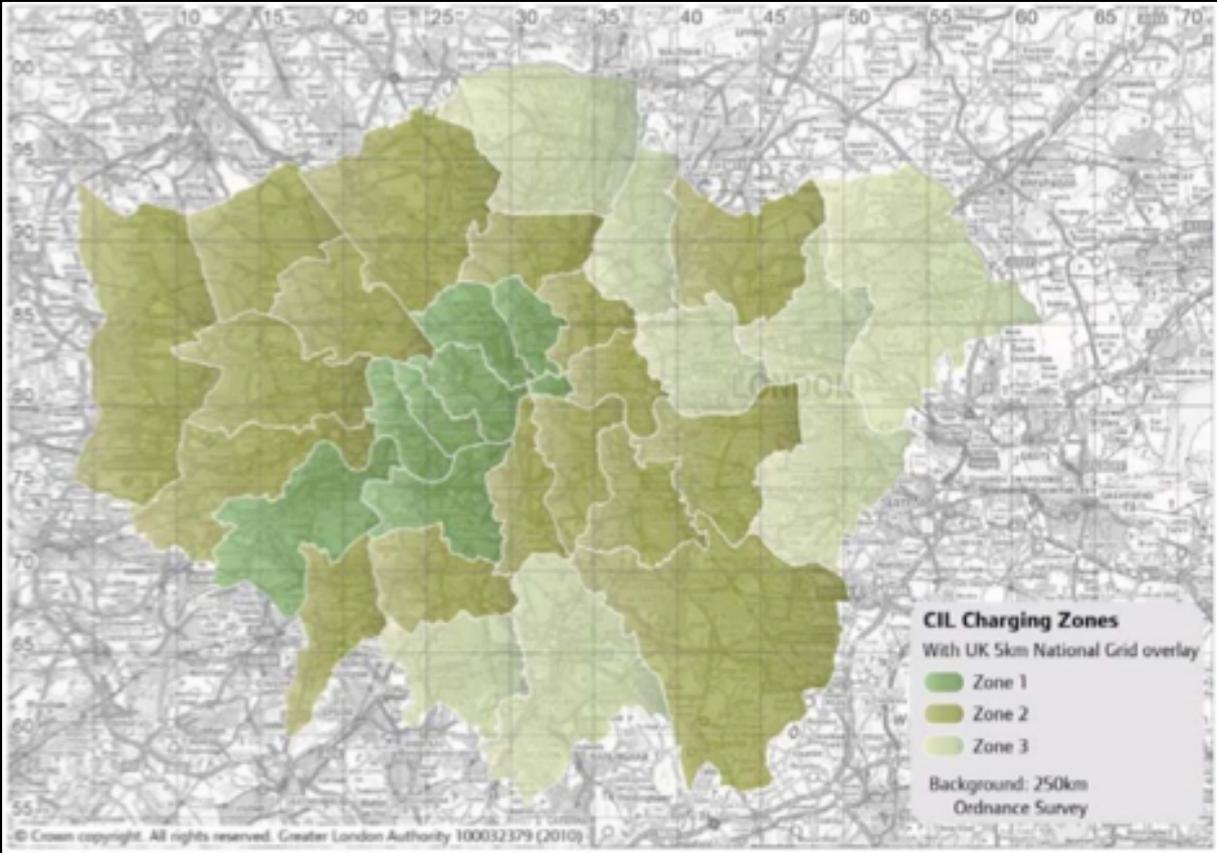
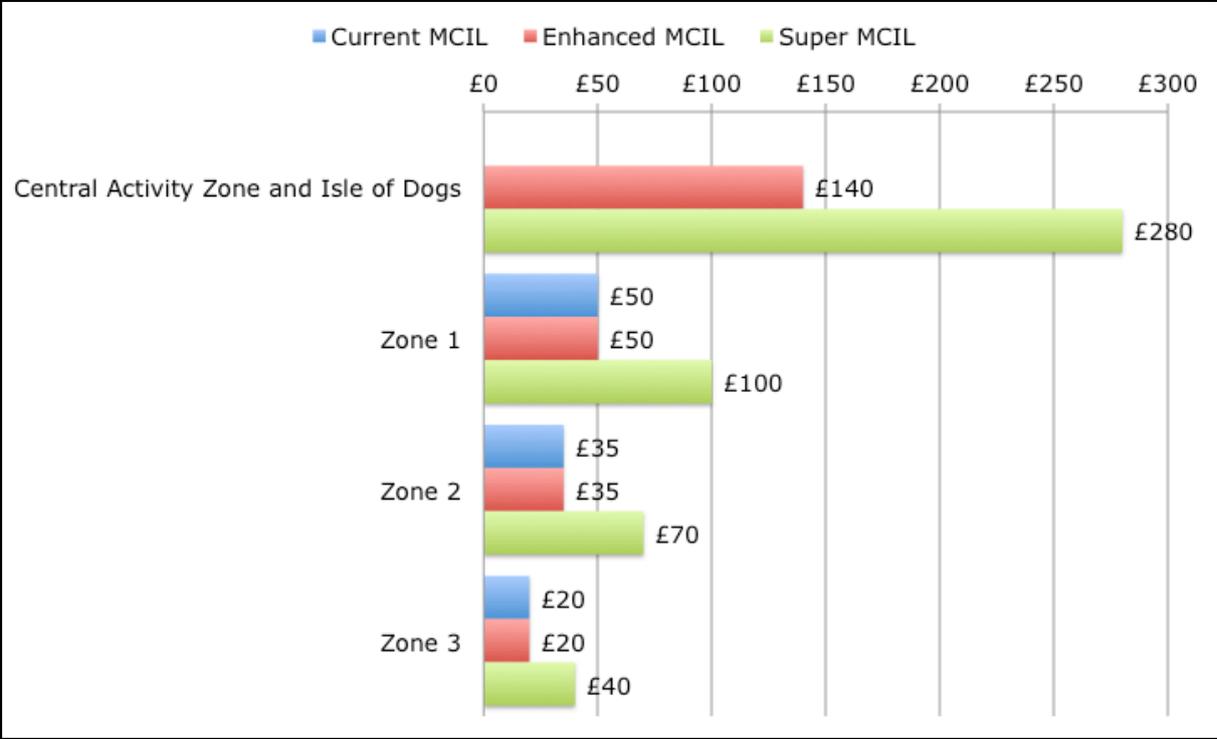


Figure 9 shows how MCIL rates could be extended and doubled to achieve the higher contributions shown in Figure 7 covering 12% of the total costs.

Figure 9: MCIL possible enhancements and doubling



Resale of land and property

Resale of land and property is based on assumptions that:

- Land and property values would grow at 4.7% per annum
- Land purchased would be sold off over a 2-year period, 2029/30 to 2030/31
- There would be like-for-like replacement of previous land use
- 50% of the initial capital expenditure could be recovered

These assumptions were probably conservative, if there was scope for additional development gain on land along the route sold back with permission for further development.

Council Tax Precept

A Council Tax Precept of £8 per annum until 2017 per Band D property was used to fund the Olympic Games. PwC assumed that this precept would continue at the same level for Crossrail

2 to 2025, after which it would be increased by the cumulative RPI change to £13.33, and remain at that level until 2037.

Other suggestions for funding sources

Other funding options suggested by London First included:

- A hotel tax, as used in other cities in Europe. Scott said that in other cities this was often offset by exemptions from taxes such as VAT, and that London hotels are already highly taxed by European standards.
- A London Employer Payroll Levy, equivalent to the “versement transport” in Paris, which would apply to commuters from outside London.
- Fiscal devolution.
- London-wide fares rises over RPI+1% for several years, but fares rises should ideally be held in reserve as a balancing item, rather than a core part of the package.

Additionally, Mayoral Development Corporations could capture land value uplift from more housing, as is proposed for the redevelopment of Old Oak Common triggered by HS2.

How can Crossrail 2 be financed?

Scott assessed possible approaches to finance against various criteria set out in Table 3.

Table 3: Crossrail 2 private finance: summary of criteria

Criterion	Commentary
Value for money	Private sector debt costs more than TfL or HMT debt Requirement for equity in a private finance structure would increase overall finance cost
Lending capacity	Large private financings rarer since financial crisis (Thames Tideway Tunnel £4 billion) Little appetite for high risk projects like Crossrail 2
Balance sheet	Even if private finance were available, the project might still be on the public sector balance sheet
Risk transfer	Benefits of risk transfer would have to outweigh additional finance costs

Finally, Scott reviewed the applicability of Crossrail’s options, set out in Table 4, assuming borrowing on the terms of debt issued by the Public Works Loan Board (PWLB), interest of 5.8% (5% gilts long term reference rate plus the PWLB margin), with full repayment over the life of each funding source.

Table 4: Crossrail financing and applicability to Crossrail 2

Entity	Funding source	Finance raised	% of total	Description	
TfL	Revenue	£1.9 billion	12.9%	£1.0 billion EIB loan £0.9 billion PWLB loan	✓
GLA	BRS	£4.1 billion	27.7%	£3.5 billion PWLB loan £0.6 billion direct contribution to TfL	✓
DfT	C-DEL	£4.96 billion	33.6%	Central government grant	✓
	Network Rail access charges	£2.3 billion	15.6%	Financed through Network Rail RAB	x
	Private contributions	£0.6 billion	4.9%	Negotiated with City of London and private companies	x

Closing questions

Scott ended with three questions:

- Can the proposed funding mechanisms be successfully implemented?
- Will a 50% central government contribution be affordable for the Department for Transport during 2020-2030, given required cuts and other projects such as HS2?
- How could alternative futures for London affect the funding of Crossrail 2?

Discussion

David Parish (Independent, ex-PwC partner) asked why not seek contributions from Guildford and Woking, or move Surbiton to a Zone 7? **Scott** agreed that these would be beneficiaries of the freed capacity.

Tom Worsley (University of Leeds) asked whether fares had been modelled as user revenue or net incremental revenue. **Scott** indicated the latter. **Dick Dunmore** said that models for Crossrail 1 had distinguished the two by apportioning revenue per journey across the operators or lines used.

Stephen Bennett was surprised at the high renewal costs after only ten years. **Scott** conceded that the allowance was simplistic and might be excessive.

Robert Cochrane wondered what would happen if the scheme was built in the public sector and then franchised and some costs recovered through a premium of revenue over operating costs, analogous to the likely approach to HS2. Had this been looked at, and could it work? **Scott** said that it not been looked at, but franchising might be possible after construction. However, the franchise would be part of an integrated system with little control over fares, as with the London Overground.

Neil Fleming (Department for Transport) asked whether Optimism Bias should be applied to operating costs. **Scott** said that some had been applied, especially on the renewals profile. **Neil** said that WebTAG recommended 41% Optimism Bias at project GRIP Stage 1, reflecting the unknowns at that stage.

David Metz (UCL) asked whether land use changes and value enhancements had been looked at: they are not included in the standard approach to appraisal, which uses time savings. Did **Scott** think that they could be included? **Scott** said that as yet there was no good method for doing so.

David Spurling (Learning Through Cooperation Ltd) thought that Dave Wetzel's land value tax would be ideal, as the present rates are a mess. What about a syndicalist fund into which employees contribute? **Scott** reminded the meeting that any charge on existing residential property was politically toxic.

Doug Rose (Arup, ex-PwC) had two questions: was it reasonable to extract so much money from the private sector, and was 50% a target or had it emerged from a bottom-up analysis? Scott was not sure that we are getting any better at capturing money this way, but the mechanisms are becoming more politically acceptable. Compared to Crossrail 1, Crossrail 2 would be more reliant on government grant, and HS2 could not expect material "local" contributions.

Martin Higginson thought that Optimism Bias of 66% was high and penalised schemes with accurate costs. Was it fair? Scott said that Optimism Bias was based on a Mott MacDonald report around 15 years ago on how costs rose with progression through the project cycle. **Neil Fleming** said that WebTAG was clear that Optimism Bias was only for appraisal, not for financial analysis, and could be removed. **Scott** said that HM Treasury had asked that it be applied. Neil was concerned that Optimism Bias should not be seen as an "allowed budget", and noted that it would look "weird" if financial and appraisal results differed.

Alan Peakall felt that co-funding HS2 and Crossrail 2 would be difficult, but could HS2 work without Crossrail 2, and had Crossrail 2 been modelled without HS2? **Scott** said that this had not been done: **Alan** wondered whether it should have been done.

Report by Dick Dunmore

DfT Transport Analysis: developments and challenges

Amanda Rowlatt, DfT

Arup

27 May 2015

Introduction

Amanda Rowlatt began by explaining that her presentation would cover four features of the current DfT transport analysis. These would be:

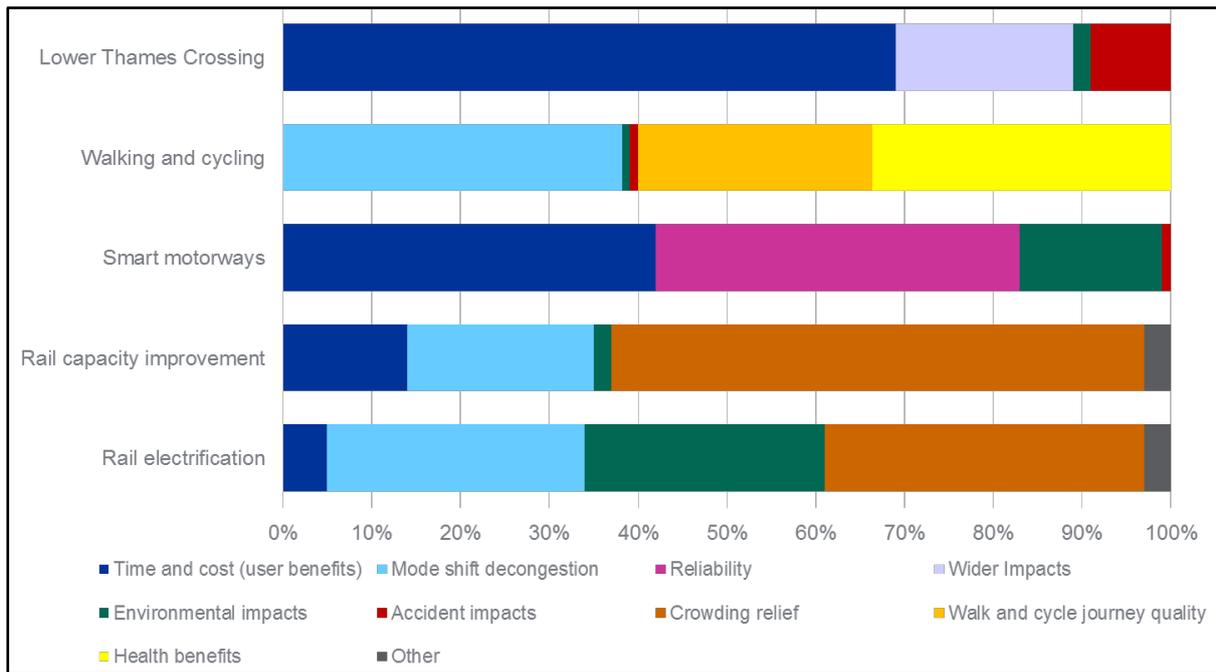
- An overview of the results of recent value for money assessments
- Understanding trends in transport
- Improvements to appraisal practices
- Future challenges

Value for Money assessments

90% of transport schemes assessed in 2014 showed very high value for money; that is a benefits-to-costs ratio of greater than 2:1. Almost half of the schemes had BCRs of greater than 4:1. Examples of some of the schemes assessed are included in Appendix 1. Amanda pointed out the dominance of road schemes in the higher Value for Money categories. In response to a query from the audience, she acknowledged that DfT did not keep any systematic record of high VfM schemes which were not proceeded with by their sponsors.

The appraisal work by DfT had identified how different types of schemes offered differing balances of benefits, as illustrated in the following chart illustrating the proportions of benefits for various types of scheme. Overall there was a significant effect from time and cost (user) benefits for many of the schemes analysed in 2014.

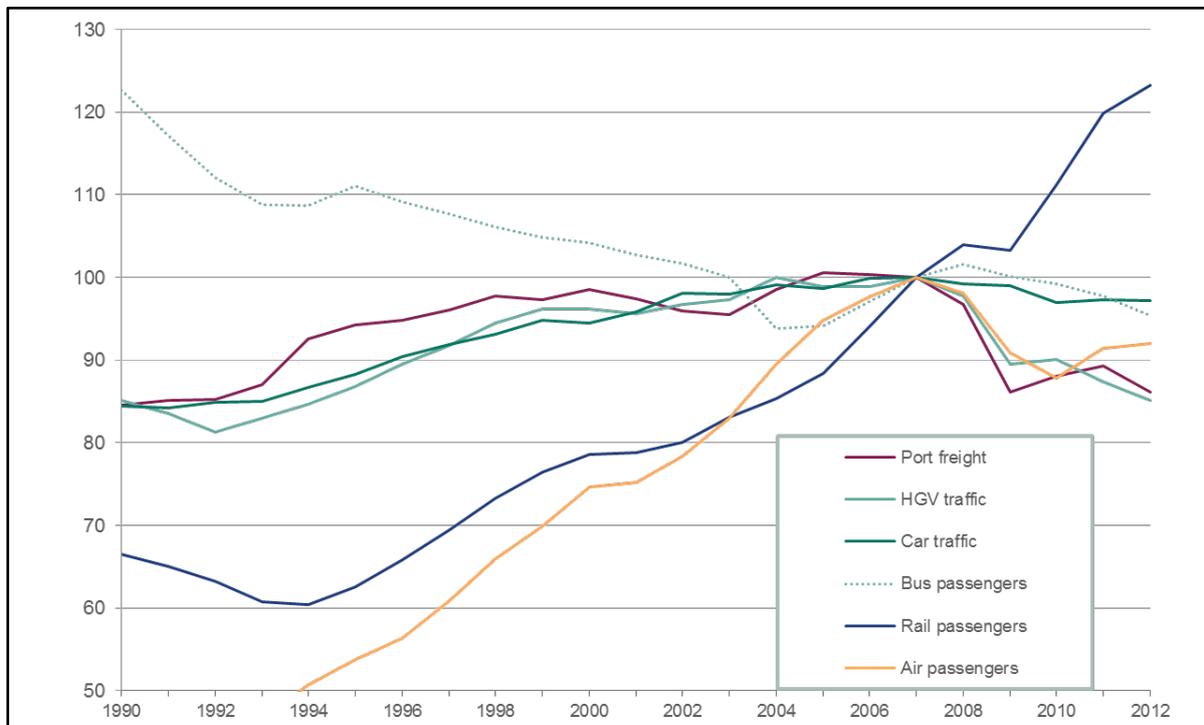
Figure 1: indicative benefits from different schemes



Understanding transport trends

Over the last 25 years there have been substantial changes in transport demand within and between modes.

Figure 2: transport demand 1990-2012

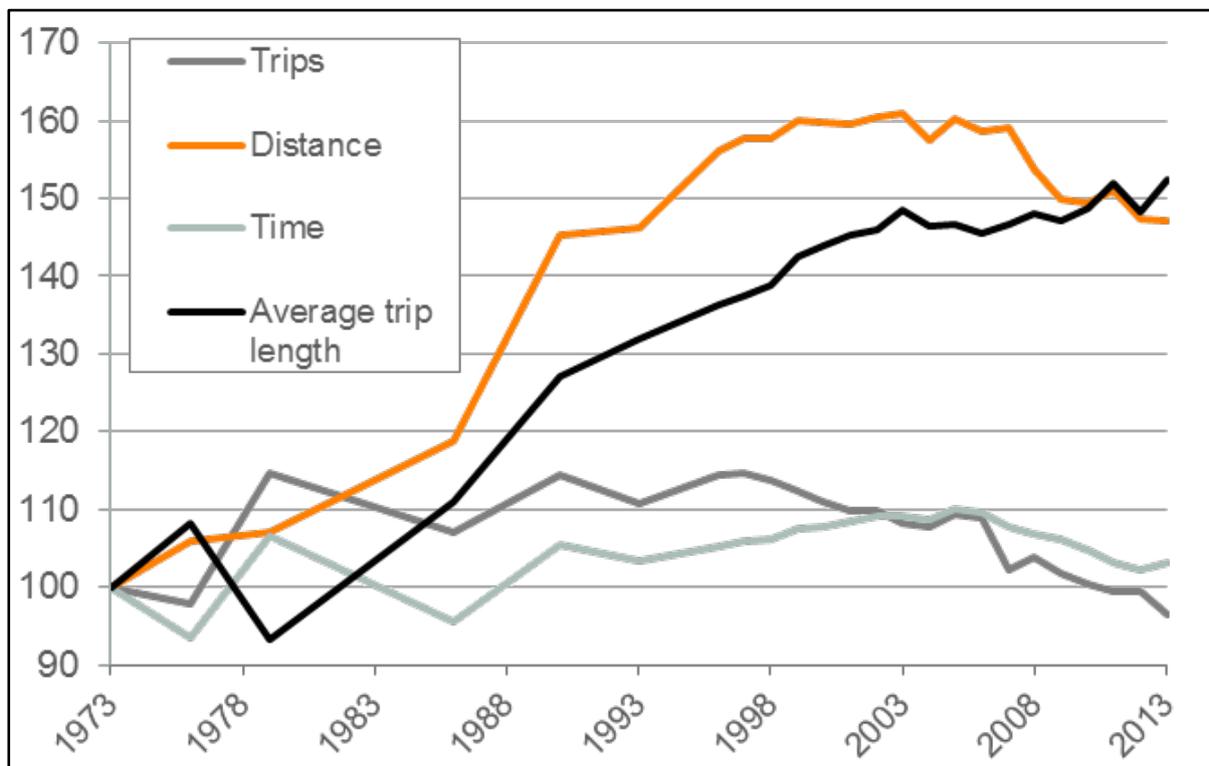


Note: index of passenger/tonne-kilometres (2007 = 100)

There have been some interesting recent variations to past trends. Car traffic has been broadly flat since about 2002, leading some commentators to speak of “peak car”. In contrast rail traffic has seen continued growth since the 1994, despite the 2007 banking crash and subsequent recession.

Over the longer period 1973-2013 there have been complex changes in travel behaviour. The number of trips per person is now below that for 1973, and the one roughly constant factor over 40 years has been the overall time spent travelling.

Figure 3: changes in personal travel behaviour, all modes



Note: per person per year (1973 = 100)

Looking specifically at road traffic, the volume using motorways has increased by over 10% since 2003, whilst that on both urban “A” and “Minor” roads has declined by around 5%. Traffic on other roads has shown renewed growth following a decline after the 2007 banking crisis and subsequent recession.

Forecasting the future

The new approach to road traffic forecasting involves assessing each of six scenarios to determine the sensitivity of forecasts to changes in behaviour, incomes, prices and so forth.

Despite some of the more recent trends, DfT is forecasting continued growth in car travel under all six scenarios. This is partly driven by the anticipated increase in the UK population, which offsets any fall in the number of trips per person. Other key drivers are seen as changes in disposable income and travel costs. Congestion is expected to rise between 8% and 17%, but vehicle emissions are projected to fall through increased engine efficiency and users choosing to buy more economical cars. These affects lead to a projected increase in road traffic somewhere between 20% and 50% by 2040.

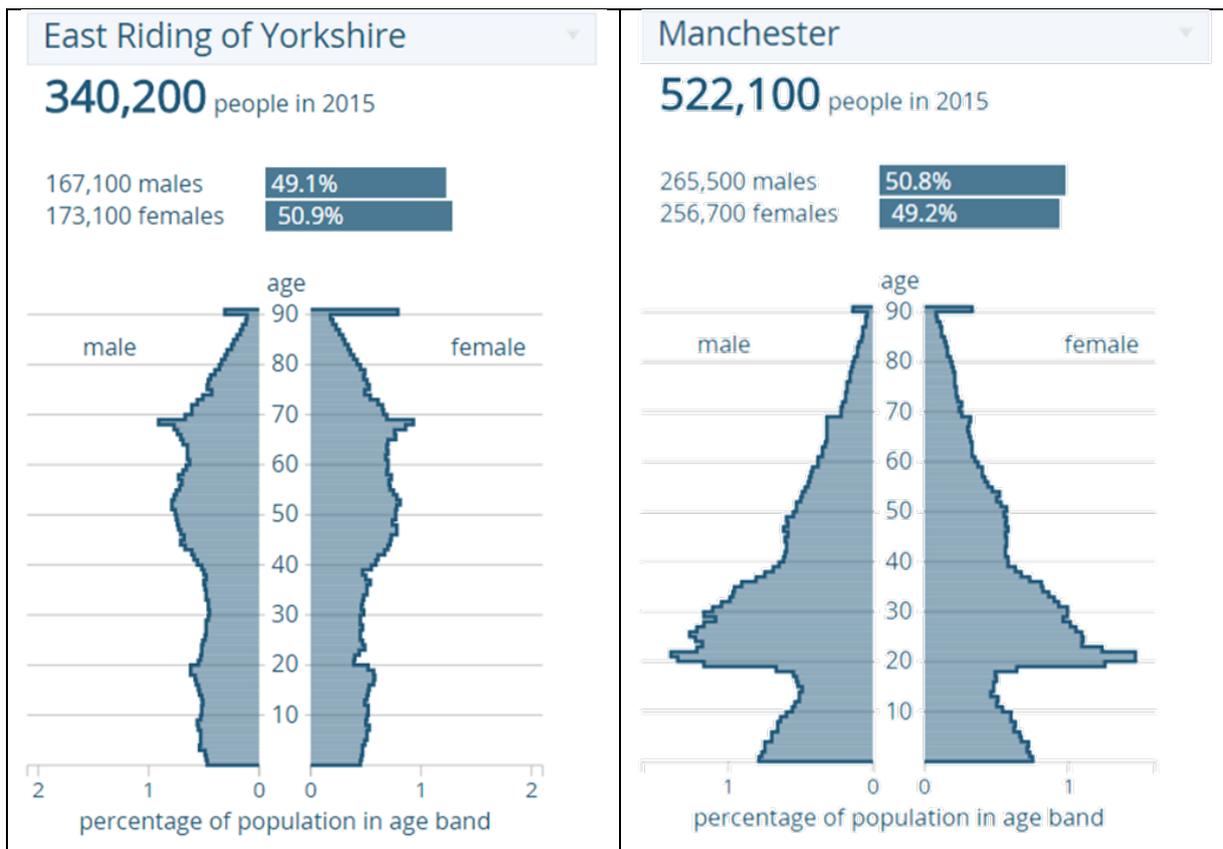
DfT is keen to continue the development of its modelling capability and is developing a new *National Transport Model* as part of its "Futures" project. It is conducting additional research into trip rates to help forecast changing travel behaviour and how key variables, such as internet use, migration and income, might influence travel patterns over time. These results will feed into the *National Trip End Model* update due for release in early 2016. Research is also being conducted into the possibility of using "Big Data", for example based on mobile phone usage, to assist with the modelling.

An example of one potentially significant influence on transport demand is the markedly differing populations of urban and rural areas. Comparing the age and gender distribution for those living in the City of Manchester and the East Riding of Yorkshire demonstrates the extent of the differences. Whether such differing age and gender profiles will persist as agglomeration increases and the cohorts age is just one uncertainty.

These variations are significant for forecasting since car usage has fallen amongst young people in recent years, driven by:

- The high costs of learning to drive and car ownership
- Young people living at home for longer and delaying marriage and the start of families
- Higher youth unemployment
- Changing attitudes to travel, ownership and the environment

Figure 4: comparative age and gender distributions



As the rural population ages it may become more dependent on public transport.

Improving appraisal practices

The DfT work programme for forecasting the future demand for travel includes placing greater emphasis on the treatment of uncertainty, and looking into DfT’s longer term capabilities to see how it can better present a range of potential outcomes and scenarios to facilitate effective decision-making. The Department has an ambitious project looking into how it might incorporate the wider economic impacts of transport investment into cost-benefit appraisal.

A very large and wide-ranging project on the Value of Time (VoT) has just been completed. The study included examining how values might differ by mode, journey purpose and travel conditions; together with greater segmentation of the values. This will result in a much more fine-grained approach to assessing VoT and incorporating values into the models.

DfT is also examining further ways of valuing the environmental and health impacts of transport decisions. It has recently updated guidance on the appraisal of noise impacts.

Future challenges

Transport Impact on Economic Performance (TIEP)

The report *Transport Impact on Economic Performance* set several challenges for how the Department might consider the wider economic impacts of transport developments. Amanda illustrated, with before and after pictures of King's Cross and the surrounding railway lands, how transport projects could induce other investment and kick-start regeneration. While DfT will continue to use its welfare-based cost-benefit appraisal techniques, it will complement these through analysis of the wider economic impacts.

This approach is in the very early stages of development. It might begin by setting out a strategic narrative, which would then feed into the established transport modelling procedures and a broader economic analysis. Such evaluations would look at the effects on user benefits, imperfect competition (freeing up markets), investment and employment, and productivity changes (through agglomeration benefits). The further challenge would then be to report the assessments of these impacts in a consistent and comprehensible manner.

In taking this dual-track approach the danger of double counting some of the benefits must be recognised and avoided.

Other developments

Resources within DfT for appraisal work have increased over the past year. Activities as part of its *Monitoring and Evaluation Programme* include the appraisal of:

- Plans for major rail projects: Crossrail, Thameslink, HS2
- Local programmes, e.g. Local Sustainable Transport Fund projects (this is due to report in 2016)
- Changed management of strategic roads (Roads Reform)

DfT is also developing methods to strengthen links between appraisal and evaluation techniques. The new Government regards transport investment as vital to delivering economic growth and sees it as a high priority policy. Manifesto commitments were made on:

- Transport investment in the north of England
- Devolving more transport powers to elected mayors
- Providing a response to Sir Howard Davies' *Airports Commission*
- Investing in the strategic roads network
- Crossrail 2
- HS2, allied to growth strategies around major station hubs

At the same time the Office of Budget Responsibility anticipates from its analysis of the March 2015 Budget that resources will be severely constrained over the next few years. The difficult task will be to ensure Britain makes the most of the existing infrastructure and facilities. Overall this suggests a large amount of work and considerable challenges ahead for DfT.

Discussion

Dick Dunmore (Steer Davies Gleave) said that 10 years ago the emphasis was on understanding the effects of economic growth on transport demand and planning. Today the emphasis appears to have reversed, with transport planning seen as an engine of economic growth.

Stephen Plowden (independent consultant) noted that there appears to be continuing emphasis on "trend planning". Also, the methodology for appraising public transport schemes has been to include the benefits for non-users, but to assume that the benefits for users are collected through the fare box. Is this still the case? **Amanda** replied that the economic analysis looks at the overall benefits to people. Who pays forms part of the financial analysis. The requirement is to mesh these aspects of the appraisal to form an overall recommendation.

John Cartledge (formerly London TravelWatch) said that it is encouraging that the health aspects of walking and cycling are

now included in appraisals. Work also needs to be undertaken on the health benefits or disbenefits of using public transport.

Alistair Baldwin (Hertfordshire County Council) asked what the appraisal of the Croxley Link showed in terms of value for money? Amanda said that she could not provide an answer, but the appraisal included the regeneration effects of the link.

Roger Lewis (Campaign to Bring Back British Rail) recommended that the speaker read Professor Terry Gourvish's book on the history of BR from 1974 to 1997. Has DfT analysed the financial and economic impacts of rail privatisation? **Amanda** replied that the difficulty with such an analysis would be to get agreement on the counterfactuals.

John Cartledge noted that the graph of rail patronage (Figure 2) appeared to show a change in direction from 1994, when privatisation occurred, which should be amenable to analysis.

Peter White (University of Westminster) said that the growth in rail patronage since 1994 was, to some extent, the result of both constraints placed on fares increases as part of the early franchise agreements and improvements in GDP. BR had always tended to price off growth as a means of improving its financial performance.

John Bates (independent consultant) said that removing the effect of income growth in the six demand scenarios would imply eliminating the growth in car ownership and vehicle mileage. **Amanda** replied that constraining income growth helps identify the significance of income in the forecasts: its predominant effect is reducing increases in journey length.

Stephen Plowden asked whether DfT, when assessing wider economic benefits, assumes that any increase in GDP is a "good thing", or takes into account the distribution of benefits across differing sectors of the population? **Amanda** said that the appraisal looks at the distributional effects, including that on people's disposable income.

John Cartledge asked how DfT compares with other Government departments on the quality of analysis and evaluation of policies and programmes? If external comments are to be believed, DfT is not highly thought of, especially as there have been frequent changes of ministers over the years

regardless of the party in power. **Amanda** said that the external appreciation is understandable, given the highly exposed nature of DfT. Transport tends to be about big projects which take a long time to come to fruition. Her personal experience in other departments was that the analysts have differing relationships to policy formation and ministerial decision-making according to the nature of the issues facing each department. The current Secretary of State for Transport is hoping to become the longest serving minister in that role.

David Shannon (Oxford Project Management) asked if disbenefits such as the effects on job opportunities, loss of environmental habitat, increased noise pollution and reduced property prices are included in the appraisals? **Amanda** said that evaluation of all these aspects is included as part of WebTAG and features in the analyses. The convention is not to show negative aspects separately, but to present the results in terms of net benefits.

David Starkie (Economics Plus) wondered why the percentage of schemes ranked as high and very high value for money varies year-on-year? **Amanda** replied that the economic appraisal is only one of the five evaluations undertaken on each scheme. Government might have strategic objectives which are wider than the economic case which results from the transport appraisal. This could be an argument for widening the value for money assessment to reflect even more aspects.

Karl Hounsell (Mouchel) asked whether, if the level of rigour applied to the appraisal of transport schemes and policies is greater than that applied in other departments, the DfT approach might be too detailed? Transport projects typically well outlive the tenures of most ministers and governments. **Amanda** said that DfT tries to apply a level of rigour appropriate to the size and impact of each scheme. The scale and long life of many investments requires that a thorough assessment is carried out before funds are committed.

Stephen Plowden (independent consultant) noted that he appraisal discount rate has varied considerably over time. The present 3% rate is very low, but for a major project the accepted rate might rise before the scheme is completed. **Amanda** deferred to experts present in the audience.

Michael Spackman said that the current discount rate is comparable with international norms, but might have been too high in the past.

An member of the audience asked if DfT should be actively promoting the use of telecommunications in order to reduce the demand for transport? **Amanda** replied that the potential effects of increased teleworking did not emerge from the analysis to be a significant factor in road traffic demand. It might have a role to play in dampening demand during the peak, but this has not been assessed.

Alan Peakall (Freelance economist) said that the experience of train operators in London and the South East is that home working is leading to some regular train users no longer commuting every day, or arranging to travel to workplace meetings outside that peak.

Roger Lewis (Coutts & Co.) said that no one ever seems to be held accountable for inadequate analysis leading to bad decision-making and failed outcomes. The Edinburgh tram scheme is an example. **Amanda** replied that no method of evaluation is capable of perfectly predicting the future.

David Shannon asked what confidence limits are placed on the costs used in the evaluations, given the much-publicised cost overruns on some transport projects? **Amanda** replied that a significant optimism bias is now included in all the cost estimates used in appraisals. At present there are concerns over potential price inflation in the construction industry and how to reflect this in the analysis.

David Starkie wondered if the use of an optimism bias led to inflated prices for schemes? **Amanda** said that the bias is used in the economic appraisal but does not form part of the financial risk analysis.

Report by Gregory Marchant

Appendix: DfT value for money assessments 2014

Very High Value for Money major schemes included ...	Cost (£million)
Mersey Gateway Bridge	250
M1 J16-19	223
M6 J19 -16	135
M25 J30	102
A21 Tonbridge to Pembury	70
A1 Coal House to Metro Centre	61
Crewe Green Link Road	15
High Value For Money major schemes included ...	Cost (£million)
Manchester Smart Motorway	228
A556 Knutsford	191
M5 J4a-6	106
Local Sustainable Transport Fund – revenue schemes	64
Bus Rapid Transit Bristol	34
A684 Bedale Bypass	29
South West Flood Resilience	26
Windermere Electrification	16
Darlaston Strategic Development Access Area	14
Leeds Rail Growth	10
Medium Value for Money major schemes were ...	Cost (£million)
South East Flexible Ticketing	80
Rail Wi-Fi investment	53
Poor and Low Value for Money major schemes were ...	Cost (£million)
Sheffield Tram Train Pilot	51
Stansted – Dundee Public Service Obligation	3

Transport policy, appraisal and decision-making: is the process at the crossroads?

Tom Worsley, University of Leeds

Arup

24 June 2015

Introduction

The speaker began by outlining the context of the report, which had been sponsored by the RAC Foundation and co-authored by Peter Mackie. It looked at the challenges facing transport appraisal and its role in informing decision-makers.

The 2005 HEATCO report and the authors' 2013 report suggested that UK appraisal methods were technically among the best in Europe and play a role in decisions. However there were questions raised by devolution, the impacts on the "real economy" and quality of life and technical weaknesses such as reliability and value of time savings. The method of inquiry was to interview 18 experts and to undertake a literature review.

The talk would cover developments to date, the role of appraisal in decision-making, and the present challenges.

Transport appraisal had evolved and developed of the last half century. COBA had been used from the late 1960s, but following objections had been widened to include a framework for environmental impacts and some others: ACTRA 1977. Cost Benefit Analysis (CBA) and been applied to urban schemes such as light rail, the Central London Rail Study (CLRS) and Jubilee Line Extension (JLE). Later developments included NATA, the Appraisal Summary Table and WebTAG.

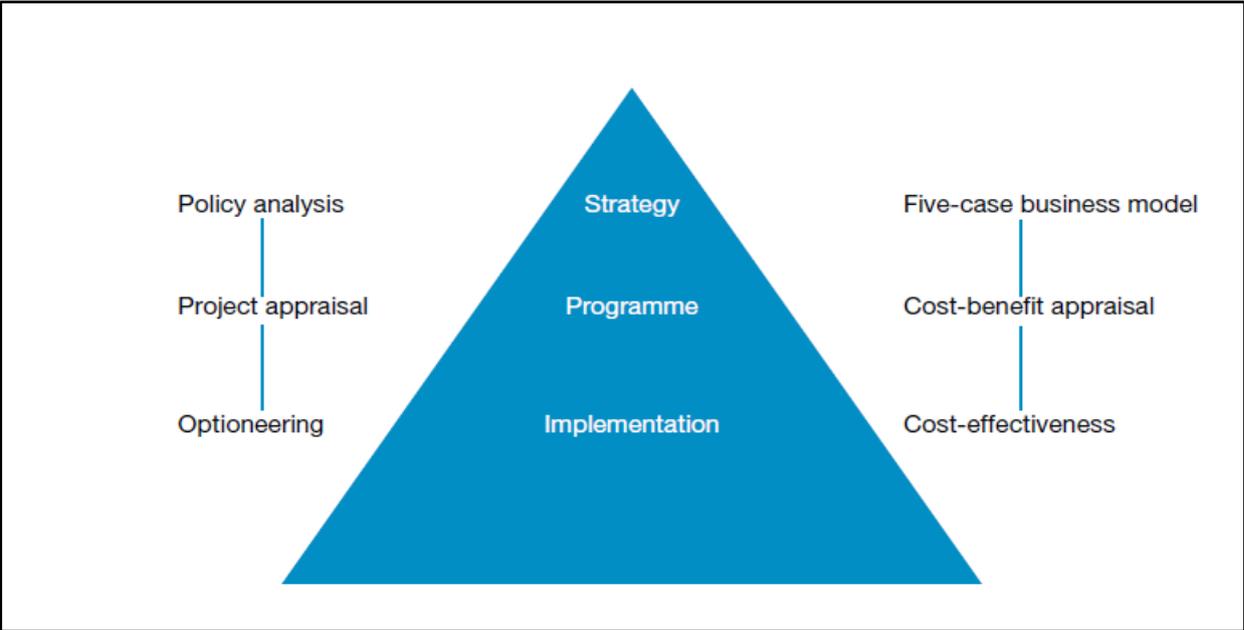
SACTRA's report on Transport and the Economy was published in 1999, while the Eddington Report recommended the inclusion of wider economic benefits. The 2007 High Level Output Statement (HLOS) was used to appraise the value for money of a programme of rail enhancements. There was the NATA Refresh 2009, Transport Business Case 2010 and DfT's 2013 UVITI. There is a lot of commonality between evaluations of the

Victoria Line in 1963 and Crossrail today, although the latter is a more sophisticated.

Assessment was a necessary process, used for a wide range of projects, which provided an evidence-based means of prioritisation. Policymakers had told the authors of the report that if it hadn't existed it would have to have been invented. Appraisal was required because many decisions were devolved to bodies such as Network Rail, the Highways Agency and local authorities, because of the role of Treasury in spending reviews, to demonstrate that schemes delivered value for money and conformed with the Green Book, to satisfy scrutiny by the Public Accounts Committee and by Public Inquiries and to meet the requirement for a framework for a democratic accountability process.

This was a flexible evolutionary process, with change followed by stability. Appraisal was responsive to policy change: for example "an integrated approach" 1997 with benefits of active modes and wider economic benefits. Many other countries use a comparable process. There are external challenges, such as Eddington, and developments within government, such as the establishment of the Treasury 5 case business case model in terms of the Transport Business Case.

Tom said that in order to reach out to a new audience we needed to move beyond the benefit cost ratio.



Tom ranked how influential appraisal was (marks out of 5).

Rank	Activity
****	(***** without Pacer replacement). Project ranking and selection (except megaprojects which scored much less). Judgement: effective and strengthened by DfT's Value for Money objective.
***	Programmes and Plans, such as RIS, HLOS, 2000 TYP. Judgement: the "programme" is a package of schemes.
**	Policy goals: cutting road deaths, liveable cities, economic growth. Judgement: works best with CBA-compatible metrics.
* (?)	Policy levers: bus and rail deregulation and privatisation, concessionary fares, HA reform, road pricing. Judgement: there is limited use of appraisal but some glimmer of change. In some cases, such free bus travel for people of pensionable age, there was no economic analysis and decisions were made on Ministers' beliefs.

There was a need for a strategic narrative to fit objectives. The Treasury Business Case (TBC), setting the CBA in context and providing an opportunity for a more objectives-led approach, was an opportunity with evidence provided under five cases:

- Economic: WebTAG welfare economic costs and benefits
- Financial: funding, private contributions, revenue, risk
- Management: delivery, governance, assurance
- Commercial: contracting, procurement and risk
- Strategic: narrative, problems, need, strategic fit, why now, scheme in context

Among the challenges facing the analysts responsible for the economic appraisal is ministers' desire for big announcements, although Eddington warned against "*grands projets*" mainly on VfM grounds. A coalition may be more successful than a single party government in ensuring that commitments are not made without robust evidence to support a proposal. Big studies tend to create their own momentum: it is difficult for a minister to admit that an idea is worse than first thought, or to agree to writing off sunk costs of developing the project.

The opportunity cost of big projects is unclear though, because of their size, probably from the budget of other transport schemes. Conventional appraisal is challenged by ill-specified objectives for schemes such as "rebalancing while maintaining London's pre-eminence".

The speaker then discussed transport investment and economic performance. Macroeconomic relationships are well established, but policymakers want to be able to demonstrate the effect of schemes on the "real economy", a difficult question to set in the context of the Chancellor's macroeconomic policy. The approach outlined in the recent "Transport investment and economic performance" (TIEP) report for DfT centres on:

- First round, business transport cost changes
- Second round, static agglomeration in urban areas (transport cost reductions increase economic mass) and further dynamic effects of firms' and households' responses changing the location of economic activity

The approach indicates that links between transport investment, economic mass and productivity, mean the focus of investment to boost economic growth will be on urban areas.

Which metrics should be used for CBA and the "real economy"? The Benefit Cost Ratio (BCR) or DfT's VfM (high, medium, low, poor) metric provides for:

- Go/no-go decision
- Ranking: prioritising schemes which can be funded by the budget allocated
- Documented, evidence based methods
- Accountability, against performance objective
- Gross Value Added (GVA) metric
- Impressive number, though largely divorced from Chancellor's strategy
- Evidence of "paying for itself" if the GVA exceeds 35% (the average rate of tax on GVA) of project cost
- Evidence of spatial impact of benefits

Conventional appraisal methods tend to ignore supply-side responses. CBA can be considered a tool for bottom-up national planning of transport networks under the control of central or local government. Reality is different: franchisees have some freedom to set fares, open access operators can enter the market, and national and local authorities' objectives interact. Autonomous vehicles are a potential challenge to the highway supply function. As an example, the benefits of more London airport capacity feed through into lower airfares, a possible decrease in airline asset values, and in airline responses. Where do benefits end up: do they feed through?

The increased tendency for a local contribution, usually from a supplementary business rate, towards the funding of a scheme, raised questions about how this additional cost to business might be accounted for in any estimate of the impact of the scheme on the local or national economy.

Technical challenges to current appraisal methods include:

- Values of transport users' time savings, an issue which is now being addressed by DfT.
- Resilience and reliability: valuation is less of a problem than modelling how an intervention changes the variable.
- Health impacts: physical fitness effects and values are based on limited evidence. There is no attempt to assess how health might be affected by the choice between car or public transport. Rail and bus travel mean more walking.
- Modelling of responses: models exist of how firms and households change location in response to transport cost changes but the few such models are still "on trial". Freight models are still in the dark ages.
- Integrating transport cost changes and land use changes within the CBA framework borders on "too difficult" even if, as noted above, there have been advances in modelling transport-induced land use change.

Devolution shifts responsibility for local transport from Whitehall to local government, generally with national funding remaining, but challenges remain:

- Responsibility for high level objectives, funding, outcomes, assurance, mediation (between national and local objectives on “shared” links or planning control totals) remains with central government. Does it trust LAs?
- Other challenges: economic impact models, mixed programmes with some of the investment in assets or programmes with no appraisal methodology (but good evaluation practices), capabilities within LAs.

LAs are encouraged to compete for funding, but should this competition encourage jobs to transfer between cities and regions? There is a wide range of outcomes: London is out in front as the Greater London Authority and Transport for London help delineate responsibilities with the London Boroughs. Greater Manchester and Transport for the North are following London’s lead, despite a more complex structure, and hope to be where London is now in five years’ time. However there is a “mosaic” of outcomes elsewhere.

Ministers will still want to intervene by delivering policies that can only be implemented through local schemes, to ensure that national objectives (transport and land use planning) are not overridden, and to be accountable for nationally raised funding. At the end of the day local autonomy only goes so far, and Whitehall is still responsible for outcomes.

Tom ended by discussing “arm’s-lengthening”, with high level objectives set by central government but decisions about how to deliver them devolved to Highways England and Network Rail with the aim of incentivising efficient delivery of investment and management of infrastructure. The Dutch experience suggests that 10-15% savings are possible when the infrastructure provider is given more autonomy.

The policy creates a triangular relationship between central government, infrastructure provider and local authorities. It raises the question of whose objectives come out top: for example strategic traffic, or commuters contributing to local goals such as the Northern Powerhouse? Targets such as rail reliability incentivise and are simple and widely understood through organisations. CBA has multiple objectives with trade-offs “too complex” for management purposes, so targets drive option selection, but CBA is still used to ensure acceptable VfM.

Agencies prefer simpler objectives, but these can lead to wrong decisions. The 2007 HLOS crowding target, for example, was defined in terms of reducing the number of passengers in excess of the crowding standards (PIXC) at the point of entry into London terminals. By failing to adopt the target, admittedly more complex, of reducing the time passengers spent in crowded conditions, the option of reducing the costs of crowding by increasing speeds was ignored.

Tom concluded that appraisal has had an essential role, in particular at the scheme level. DfT must remain the guardian of good practise and has been flexible, but faces a new institutional framework: particularly devolution, the “real economy” and “arm’s-lengthening”. Analysis must extend to a better understanding of spatial and local economy impacts, but the methods for predicting such impacts require development. DfT needs to remain the guardian of good practice.

What should we be doing now to improve and inform policy making through evidence based methods?

Discussion

An unidentified speaker wondered what the state of the art is in evaluation: have we achieved what we have set out to do? **Tom** replied that DfT has recently launched an evaluation strategy, but it is fantastically difficult. In response to a SACTRA report recommendation on traffic generation, DfT commissioned an analysis of the Manchester Motorway Box. This required a new transport model of Manchester without a motorway box because the original model was out-dated. Evaluation needs to focus on certain key objectives: land use is crucial but appraisal is mostly about time saving.

Dick Dunmore (Steer Davies Gleave) commented on an evaluation of the reopening of Laurencekirk station in Scotland, which was dominated by commuters to Aberdeen. The outcome might have proved highly sensitive to the price of oil.

David Metz (University College London) asked if we should rethink the approach to appraisal to bring it into line with outputs? DLR caused regeneration. Standard techniques on user benefits are not fit for purpose and should be revisited,

and we could use spatial and urban economics. **Tom** replied that the solution should be close to LUTI models. It is hard to predict property price increases. Land development may be facilitated by transport investment, but other costs and benefits will often need to be considered. Not every scheme is for regeneration (there may be more to a scheme than land use changes) and it is politically difficult for ministers to say that a scheme is being done to raise land values. For example, the A14 upgrade allows Cambridge to develop, but the main benefit is for lorries from Felixstowe.

Peter Burgess (Transport Economics Ltd) said that there was a question of separate pots of money. Can you prioritise spending? **Tom** said it is worrying if different pots give different value for money, but money cannot be moved between them.

Andrew Last (Minnerva) asked how ministers can be persuaded to use an analytical basis for megaprojects. **Tom** said that megaprojects are hard to appraise: there are major effects and they can be very expensive. There have not been many in the past, but they may be more frequent in the future. However, to date it has always proved possible to get more capacity out of existing systems such as the Underground. The answer may be setting up bodies such as the Davies Commission, although it was set up for the wrong reason.

Neil Fleming (DfT) said that we sometimes started with a preferred project and refitted it to get a solution: instead we need a logical approach, rules-based with evidence. **Tom** replied that a problem was that rail investment schemes were generally led by rail engineers, and analysts found it difficult to challenge their assumptions. Highway engineers were more open to challenge and, because of the existence of the Design Manual for Roads and Bridges, generally reached agreement on solutions. Each rail engineer often had his own opinion, and believed that it was the only one that would work.

John Cartledge (retired) said that if the Government was using taxpayers' money then it was a good idea to adopt a logical approach and that it is shared. However, this could open up the possibility of using gaming to influence the outcome. **Tom** replied that it is quite difficult to skew evidence which is public knowledge.

Roger Allport (independent consultant) said that we have no effective way to start analysing megaprojects. The Eddington report was good but didn't get us anywhere. The three political parties agreed on a certain major rail project which would take the bulk of spending and would be the basis for the country's transport policy: all you can do is make the best of it. **Tom** replied that a single scheme is not a strategy but what we have done if there was not HS2? It is obviously different to the five year time frames for Network Rail and Highways England. What about developing a national railway policy? Road is more difficult. London was leading the way with the Mayor's 2050 strategy. You could do this for the rest of the country. There could certainly be a Northern Transport Policy, but the different cities would have to reach agreement.

Andrew Evans (Imperial College) noted that local authorities have other priorities. Are the additional hoops that transport schemes have to go through an advantage or disadvantage? **Tom** replied that it is probably not a disadvantage. Local Authorities like transport schemes. Nationally DfT has its own transport-only pot of funds. **Peter Mackey** said that that the Eddington report may have saved London's transport policy by concentrating on GVA and CBA. Returning to a previous question, it is also a game for Whitehall.

Tim Elliot (Barn Brae) said that it was hard for ministers to make a case for increasing land value. He was aware of a scheme that created disbenefits but was justified by increases in land values.

David Spurling said that appraisal was more interested in time savings, but that as a generality women were more concerned about comfort and less about time savings. Is this considered? Should we not use monetary units but adopt the Lichfield planning balance sheet approach. **Tom** replied that time savings can include generalised journey time which includes penalties for overcrowding. Driving in congested conditions may include an additional weight on the uncrowded value. The DfT appraisal summary table includes details of types of benefits such as crowding and improving the local environment.

John Smith (independent consultant) said that there were wider governance objectives. For a while DfT was in denial

about the road network and is only now was moving towards using a utility basis. **Tom** replied that ten years ago carbon was taken far more seriously than it is now: sustainability was seen as not increasing carbon. Road schemes might have a higher BCR because the cost basis for rail schemes, with vehicles and staff costs forming part of the appraisal, was different from highways.

David Starkie (Case Associates) said that he thought that bus deregulation had gone through a BCR analysis. **Tom** replied that he recalled that some analysis had been done, although he was not sure that it had been successful in predicting outcomes. Were changes in service patterns and fare levels considered? The existing system is a result of the minister responsible for the policy setting the objectives of deregulation, privatisation and there being no subsidy.

Andrew Last said that there was the question of regional balance. Cities are “where it is” with factors such as agglomeration benefits, but there is also pressure to spread budgets around. What is the real world effect? **Tom** noted that the Crossrail appraisal implied that the productivity of Canary Wharf workers would increase by up to 18% when it opened because of the transport-related agglomeration benefits. Agglomeration benefits were less applicable to trunk road schemes. Perhaps highway planners should speak to the logistics sector. There is also a question of geography. Is it fair that investment should be made in those schemes, predominantly, as far as public transport is concerned, in London and the South East, which show highest value for money? We could use shadow values. **Peter Mackey** said that the future of towns with a population of 50-100,000 is an important issue, and we need a way of looking at long term options.

Report by Peter Gordon

Reviews

The views expressed are those of the reviewers and should not be attributed to the Transport Economists' Group

Railway Management and Engineering (Fourth Edition)

V.A.Profillidis

Published by Ashgate Publishing Limited,
Farnham, Surrey & Burlington, Vermont, £80

To have reached a fourth edition in only eight years says much for the popularity of this 500-page work. The book's appeal probably lies in its comprehensiveness, ranging through rail's role in transport, policies, economics (demand, costs, pricing), planning and management and, covering some two-thirds of the book, technical issues.

A great strength of Profillidis's writing is his definitions and summaries of key factors: the various international railway institutions and their respective responsibilities; the definition, scope and aims of project management; and (for example) the geotechnical and hydrogeological analysis of how subgrade affects track quality.

The book's 22 chapters fall into two very distinct parts. Chapters 1-6 consider the role of railways as passenger and freight carriers. Chapters 2 and 3 address the characteristics of lines for different purposes, their advantages and disadvantages and alternative ownership and regulatory structures. When addressing political aspects, Profillidis, perhaps slightly inconsistently, criticises the railways' "handicaps as a result of state protectionism", but also provides comprehensive check-list of why "even in a liberalised rail market, the role of the state remains critical".

Demand forecasting is considered in Chapter 4, which first sets out why it is necessary, and then reviews methods: qualitative, statistical, econometric, gravity models and time-series evaluations are each summarised. The author is very good at

explaining basic terms (such as “fuzzy logic” and “dependent” and “independent’ variables), but sometimes a little over-prescriptive, for example in suggesting that statistical projections of demand should cover “at least 10 years” and occupy up to two days work. Most of the Chapter relates to passenger demand, with only a perfunctory summary of freight. Costs and pricing are considered in Chapter 5, which is structured to set out the principles (fixed and variable, marginal, generalised costs); construction, operating, maintenance and rolling stock costs; and the pricing of infrastructure, operations and specific passenger and freight services and sets out a structure for monetising externalities. The concepts of price, income and cross elasticity are succinctly explained. Planning and strategy development are addressed in Chapter 6, usefully illustrated by clear diagrams and charts. The role of project management is particularly comprehensively presented, although Figure 6.6 (Interaction of the various components of infrastructure) is decidedly confusing. Table 6.1, quantifying a range of factors deterring the use of rail, needs to make clear how representative (or not) are scores which are strongly influenced by the nature of the sample (for rolling stock “unpleasant exterior and interior, poor cleaning and lack of air conditioning”).

The purpose of the first six Chapters may be characterised as a tutorial for engineers, to help them understand economic, political and managerial aspects of the rail industry, although others needing to learn these fundamentals will also find this part of the book valuable.

Chapters 7-22 are mainly devoted to technical issues, especially detailed coverage of the components of the railway track, with separate chapters on the track system, mechanical behaviour of the track, subgrade, rails, sleepers, ballast, track forces, layout, switches and crossings, track-laying, slab track and train dynamics. The book concludes with chapters on traction and rolling stock (those with a historical bent will appreciate the brief treatise on steam traction, although mention of the option of petroleum as a fuel is questionable), signalling, safety and interoperability and environmental impacts.

The substantial “engineering” part of the book will serve to inform non-engineers about such issues and help economists understand engineering issues. To take a single example, Chapter 11 is devoted to sleepers: alternative materials and designs; manufacturing, quality control and testing; and fastenings. The technical complexity of the engineering sections of the book will present a challenge to non-engineers, as they include numerous mathematical discussions, such as on cant and cant deficiency. However, such elements will provide rewarding insights whenever these are required, and not all are too complicated, the paragraphs on resistances caused by gravity and track curvature being good examples of how individual topics are covered.

The book contains one irritation, which presumably arose at the production stage. When illustrating a range, e.g. 1.5 to 4.5 million, instead of the usual hyphen (1.5 – 4.5), a dividing sign is used (1.5 ÷ 4.5), which takes some getting used to.

Even such a thorough work as this does not cover every aspect of railways equally. An almost complete omission is anything to do with stations and passenger interchange, surely a vital component that ought to be present.

Overall though, Railway Management and Engineering is a most comprehensive and well-produced book. There is inevitably variation in the depth and breadth of coverage of the vast number of topics, but to attempt such wide-ranging cover is hugely ambitious and one must take one’s hat off to the author’s vast knowledge. The work will suit both engineers and non-engineers, including transport economists, academics and consultants, needing to know more about (particularly civil) engineering. The range of information presented will suit readers with varying levels of knowledge and experience, whether needing to learn about a specific topic or to gain an initial understanding of a broad range of principles. Although containing topical examples and data, these issues are not excessively dominant, so the book will not rapidly go out of date: an important consideration, as Ashgate’s prices are not cheap.

Review by Martin Higginson

Will Sustainability Fly?

Walter J. Plamer

Published by Ashgate Publishing Limited,
Farnham, Surrey & Burlington

ISBN: 9781409430919

The author, a retired Air Canada pilot, has set out to write a volume on aviation's effect on the environment and possible solutions. As he says in the introduction, it would have been possible to write a book on each Chapter. As it is, the book is certainly comprehensive at over 100,000 words, and covers a lot of ground in detail. It is very well-researched and there is no doubt that the author has set out to be objective, something not always the case in books on the subject (although someone who completely denies global warming would probably disagree). The later Chapters (which discuss the issues faced, ethical responsibilities, the regulatory framework in which aviation operates, policy options and a lot more) are very comprehensive and give the reader a lot to think about: indeed some may want something a little more succinct.

An economist might however wish at times for a more numerical approach, with the chapters that discuss fuel supply and the efficiency of aviation. For example, while Chapter 4 discusses alternative sources of fuel in great detail, and discusses some very interesting topics such as the ability of bacteria to convert biomass into jet fuel, there is virtually no discussion of how likely they are to become viable, and if so when, or their cost compared with existing fuels. It is, of course, much easier to discuss likely technological advances in a periodical than in a book with a shelf life of a number of years, as it is never easy to discuss which way or how fast technology will develop. However it would have been interesting to consider a couple of case studies, perhaps *Jatropha* (which is not mentioned anywhere) and algae, discussing the existing cost, how much it would have to fall to become viable and the amount of land (or possibly ocean, in the case of algae) required to meet aviation's needs, given the arguments against biomass by advanced by environmentalists.

Similarly, Chapter 2 says correctly says that aviation has been decreasing its footprint, although the ICAO figures quoted of 4% per annum since 1960 and a likely ongoing decrease of 2% annually until 2050 may be rather high. It would be interesting to have figures as to how engine and airframe efficiency has increased and how much is due to higher load factors and other operational improvements, such as more efficient route networks, and then to discuss if these are likely to continue. Load factors cannot continue to increase for ever. An article in *Flight International* has recently said that the efficiency of converting energy in fuel to thrust has increased from 10% in Frank Whittle's day to 40% with the latest engines. This is still below the theoretical maximum, but how much further can we go and how fast? However, such discussion is available from Wikipedia, Flight or any of a number of sources.

The issues of water vapour and ozone depletion are discussed but not really quantified: a net effect of 0.3–1.4 mW/m² is quoted but this may not mean much to the reader. (Wikipedia quotes the amount of sunlight hitting the atmosphere is around 300 W/m², depending upon latitude). However, as the author says, the evidence and interpretation are changing all the time.

To summarise, the book is an excellent piece of work on the issues surrounding aviation and the environment, and should be read by anyone wanting a detailed discussion on them. It discusses the concepts very well, but does not always provide much in the way of numbers.

Review by Peter Gordon

TEG Committee 2014-2015

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The Transport Economists' Group, formed in 1973, provides a forum for people involved in transport economics to meet regularly and discuss matters of mutual interest. Membership is open to economists working in transport and others whose work is connected with transport economics.

The aim of the Group is to improve the quality of transport management, planning and decision-making by promoting lectures, discussions and publications related to the economics of transport and of the environment within which the industry functions.

Meetings, held at Arup's Central London HQ at 13 Fitzroy Street from September to June (except December), consist of short papers presented by speakers, drawn from both within the Group's membership and elsewhere, followed by discussion.

The Group's Journal, "The Transport Economist", is published three times a year reporting on meetings and other activities of the Group. It reviews recent publications of interest and contains papers or short articles from members. The Editor welcomes contributions for inclusion in the journal, and can be contacted at petersgordon@blueyonder.co.uk.

The current membership of over 150 covers a wide range of transport modes and types of organisation. Members are drawn from transport operators, consultants, universities, local and central government and manufacturing industry. All members are provided with a full membership list, updated annually, which serves as a useful source of contacts within the profession. Applications from people in all sectors are welcome.

Applications for membership should be made on a form which can be downloaded from the Group's website at www.transecongroup.org.

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Details of meetings are provided on our website at

<http://www.transecongroup.org/meetings.htm>

