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Editor
Laurie Baker

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Financing the Channel Tunnel Rail Link
"Risk vs. finance"

Mark Bayley, Group Treasurer and Bernard Gambrill,
London & Continental Railways

Presentation to Transport Economists' Group
University of Westminster
3rd July 2001

Mark Bayley introduced the talk by stating that once the risks of the CTRL project are understood then it was relatively easy to understand the basis for the public sector's risk-free financing of the project with grant and Government Guaranteed Bonds.

Risk versus Finance

In a typical PFI project, the winning bidder contracts to provide the facility required (i.e. CTRL) in return for a long term usage agreement or concession. The winning bidder and other equity providers contribute equity (about 10%-20% of financing required). Banks will lend against the risks of the project and revenue stream, without recourse to the sponsors.

Once the project is commissioned, the intention is to refinance the bank debt through a securitisation. A high degree of leverage is a key factor in generating returns.

London & Continental Railways

In 1996, LCR won the competition under the Private Finance Initiative to:

- build the Channel Tunnel Rail Link
- own EUKL[1], the U.K. arm of the Eurostar high-speed train service operating between London, Paris and Brussels

Whilst Eurostar is a popular business, its trading did not support LCR's original long-term projections and, therefore, cashflow to support the cost of constructing CTRL.

[1] Eurostar (U.K.) Limited

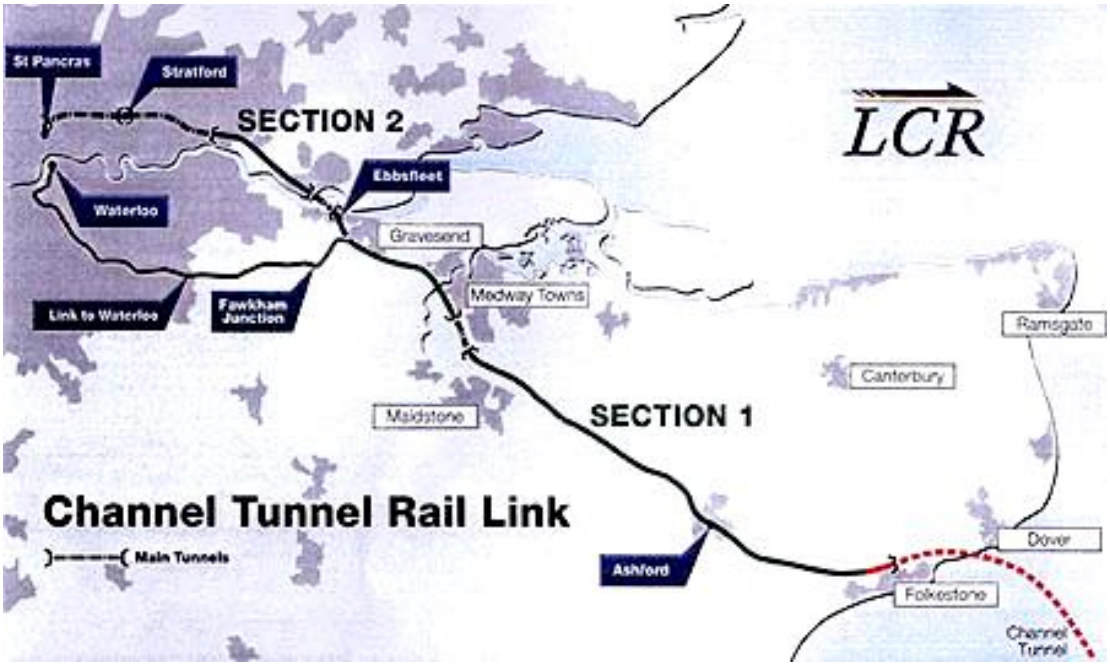
In January 1998, the Secretary of State refused LCR's request for additional subsidy to complete its plans for a flotation. This led to the need to restructure Eurostar, CTRL project and the organisation.

The 1998 restructuring

(a) The Eurostar risks of performance were segregated from the risks of the construction project. The management of EUKL was contracted to a consortium of transport operators (National Express, BA, SNCF and SNCB). A significant amount of the business risk was transferred to the consortium under pain/gain share incentives based on target levels of operating cashflow. Government also made available a loan facility to LCR to finance EUKL in the longer term, but other parties take a large measure of risk.

(b) The CTRL project is built in two stages to facilitate Railtrack's participation in bite-sized chunks:

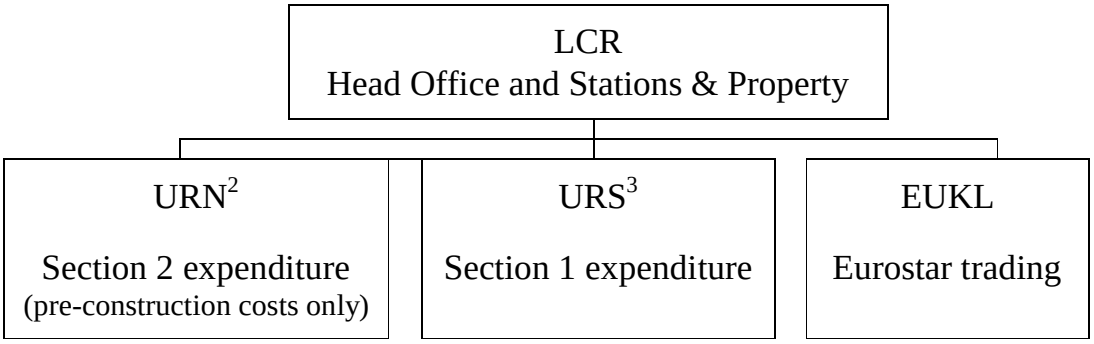
- Section 1 is from the Channel Tunnel to North Kent
- Section 2 is from North Kent to London St. Pancras



The route and specification of the completed railway were unaffected by the restructuring and LCR remains under an obligation to complete the entire project as specified in the Development Agreement signed in 1996. An LCR subsidiary, Union Railways (South) is constructing section 1. The URS

board is controlled by Railtrack, through which it has management control of the Section 1 project and Section 1 will be purchased by Railtrack when completed. Section 2 is being taken forward by Union Railways (North), under LCR's control.

(c) Organisation: the LCR group - The LCR group was restructured with LCR Head Office and the property arm, with two construction arms and Eurostar, viz.:



The CTRL project was reorganised in such a way as to have project clients and a design, engineering and project management contractor, thus:

- Union Railways (South) and (North) act as project clients for their respective Sections, under the control of LCR.
- Design, engineering and project management is contracted to RLE[4], which is an unincorporated joint venture of Bechtel, Ove Arup, Halcrow and Systra (SNCF)
- As work is completed on Section 1, many of the staff in URS and RLE transfer to perform similar roles on Section 2

Briefly, **Section 1** is scheduled to open in September 2003, with a target cost of £1.9bn (outturn prices). It is now 2¾ years into its 5-year construction programme and is two-thirds complete in cost terms, is on time and within budget.

[2] Union Railways North
[3] Union Railways South
[4] Rail Link Engineering

Section 2

Construction on Section 2 began yesterday (2nd July), which is scheduled to be completed in December 2006, and operating from early 2007. The start of construction is only one point in the life of the project, which began over two years ago.

Target cost of Section 2 at outturn prices is £3.3 billion from the start of construction and URN had, by July 2001, awarded £900m of construction contracts. By the end of 2001, URN will have awarded £1.4 billion of contracts and largely completed a land acquisition programme of some £200m.

Risk Transfer

Railtrack has agreed to purchase Section 1 at a price based on the *actual* cost of Section 1:

- actual cost
- less grant received
- plus rolled-up interest at 7%

In return, Railtrack will receive a fixed level of access charges calculated to deliver a commercial return on the basis of a *target* cost. In this way, all construction risk is transferred to Railtrack. CTRL is outside Railtrack's regulated business, with LCR effectively acting as the banker, financing all costs in the construction period.

Financing of section 1

LCR is currently financed by:

- Proceeds from £2.65bn of Government-Guaranteed Bonds issued in early 1999, which allows low cost of borrowing - not as cheap as issuing a gilt but it is off the Government's balance sheet. The Bonds mature in 2010, 2028 and 2038. The 2010 Bonds are repaid from Section 1 purchase proceeds and the long-dated Bonds are to be repaid from EUKL long-term cashflow.

- £700m of bank facilities guaranteed by Railtrack: European Investment Bank (£200m), Kreditanstalt fur Wiederaufbau (£150m) and a syndicated commercial bank facility (£350m) provide Railtrack's guaranteed facilities, which are re-paid when Railtrack purchases Section 1.

- Plus £900m (outturn prices) of 'Capital Grant' for Section 1 paid in eight quarterly instalments from Quarter 4 of 2001. Payment depends on achievement of Section 1 milestones.

Railtrack was asked to risk its own capital in support of its involvement because it reinforces the company's commitment, both presentationally and actually.

Arrangements for Section 2

Railtrack had an option to take management control of Section 2 and purchase it on a similar basis to Section 1. Since Railtrack could not exercise its option, all construction and cost-overrun risk on Section 2 remains with LCR. Ultimately this risk lies with Government in the additional financial support that it would need to provide EUKL after the CTRL is completed.

LCR has, therefore, engaged Bechtel to develop and arrange a £600m 'cost-overrun protection programme' which commenced yesterday (2nd July). Bechtel is a 52% member of RLE and a 22% shareholder in LCR but its role on the project has not changed. The programme covers costs of design, engineering, project management and construction but it does not cover land acquisition costs and inflation on the project rising above 3.0%.

The first layers of risk are borne by Bechtel and next layers by the insurance market. RLE also risks part of its fees to first layer of cost-overruns. Contractors are contracted under target-price contracts with pain/gain share incentives. This arrangement is expected to reduce by approximately 60% to 65% LCR's exposure to cost-overruns in areas of cost covered by the programme and in arrangements with RLE and contractors.

In its revised role, Railtrack will be the operator of Section 2 following completion. As the eventual operator, Railtrack will assist URN on construction of Section 2 and handle arrangements for all construction interfaces between Section 2 and the domestic rail network. Railtrack will also continue to second key staff to the project. Eventually, both Sections will be operated as a seamless railway, integrated with the national rail network for commuter services

Financing of Section 2

The additional financing requirement of Section 2 from start of construction is about £3.3bn, plus contingency. This is financed as follows:

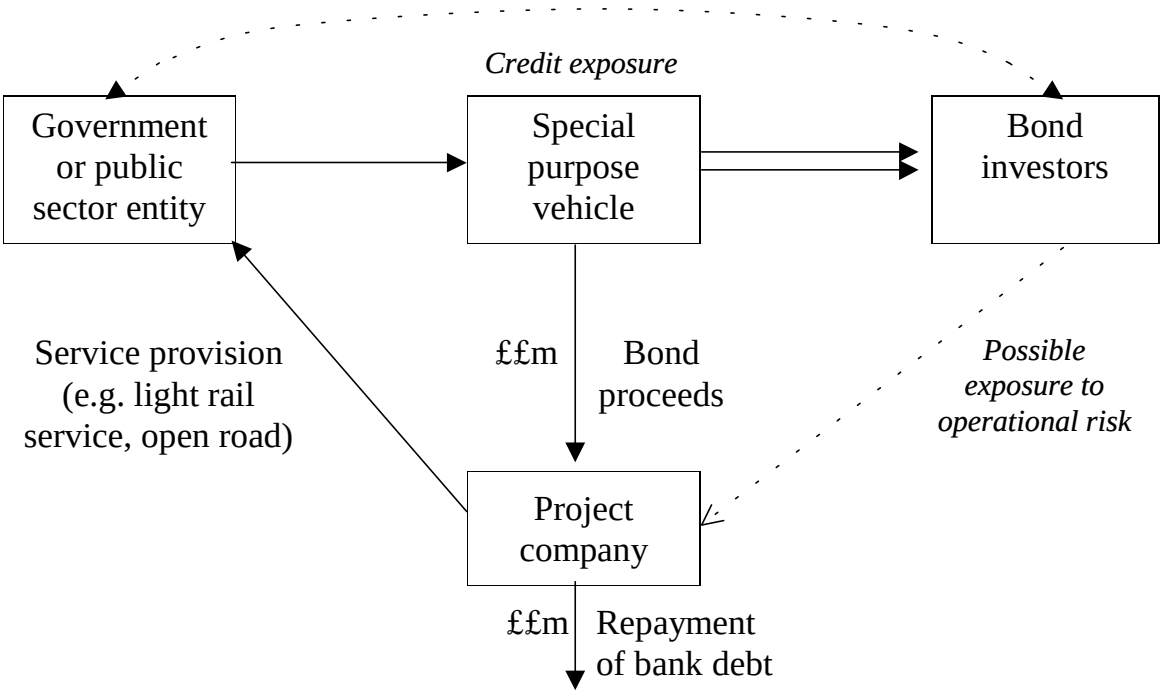
- A further £1.1bn of Government Guaranteed Bonds issued, which were committed to Section 2 in the 1998 restructuring
- £2.2bn (outturn prices) of 'Deferred Grant' for Section 2
- Proceeds from the sale of Section 1 (£1.5bn to £1.7bn)

Once Section 2 is completed, the project has two important revenue streams, which LCR expects to utilise to refinance Section 2 following completion:

1. 50 years of EUKL access charges, guaranteed by Government (40% of train path capacity)

2. 17 years (renewable) of 'domestic capacity charge' paid by Government for domestic access.

Once a project is built and earning revenue from another party with good credit, the revenue stream can be made secure:



Conclusions

The restructuring of the CTRL project and Eurostar effectively segregated the risks associated with these activities and enable different risk transfer packages to be constructed around them. Government was prepared to let risk-free

public money flow into the CTRL project and EUKL only once its exposure to these risks had been substantially reduced.

Finally, Mark had some miscellaneous observations to make:

- Combining Eurostar with the CTRL project was a good idea at the time but a gamble for both LCR and Government – containing the potential for a 'lose - lose'

- Eurostar was a capital intensive start-up attempting to sustain with a very high fixed cost-base, paying for:
  - the Channel Tunnel
  - British Rail's development of infrastructure for regional Eurostar services

  Thus its problems were due largely to its inheritance, not the business itself.

- The Channel Tunnel was to be built "without a penny of public money". However, British Railways and SNCF agreed to purchase half the capacity of the tunnel until 2052. This amounted to much the same thing

- Building a very large project in two sections has resulted in a number of distinct advantages:
  - Experience of Section 1 and lessons learned can be applied to Section 2
  - In particular, long lead-time before going out into the field on Section 2 is a major benefit.
  - Established teams with long-standing experience of each other and the project are building section 2.
  - Financing is not constrained by market capacity issues

Discussion

Michael Woods *(AEA Technology Rail) agreed that combining Eurostar with CTRL was a good idea at the time. However, the forecasts of traffic on Eurostar were seriously wrong, especially with government ministers increasing them without any reason.*

Martin Brazil *(Independent) asked whether the risks of revenue had been calculated?*

The £5.2bn investment saves 35-37 minutes on Eurostar journeys to Paris and Brussels. That is only 40% of the traffic carried on CTRL; 60% of capacity is available to domestic traffic. The CTRL project should be seen in this context. The utilisation of 60% of the CTRL by domestic services might not materialise but further investment is likely. There is a gamble on whether the full capacity will be used but projects would never get started if no such gambles were taken.

Peter White *asked how much do you think Eurostar will increase?*

Estimates are not being made any more but there is no reason why EUKL should not produce a basis trading surplus. The problem is still paying for half the capacity of the Channel tunnel.

Stephen Plowden *(Independent) opined that there was a desire to get rid of long-distance commuting from existing railway.*

Don Box *thought that the economics of Channel Tunnel, CTRL and commuter services are inter-linked. Taking money from one affects the other parts. Also, with onward travel inter-linked, it is up to the government through its integrated transport policy.*

Bernard Gambrill ably offered an "engineer's" description of CTRL and to answer further questions since Mark had to leave the meeting. Bernard was parliamentary manager for the CTRL and is now involved in consultation.

He said that the real difference between Section 1 and Section 2 is that the former is generally open while the latter is generally in tunnel. The Nominated Undertaker has to produce a railway to the NEWT[5] test. There are a number of agreements to achieve this:

- Environmental Memorandum that embodies the Environmental Management Plan
- Planning Memorandum signed with all planning authorities along the route
- Code of Construction Practice
- Heritage agreement signed with English Heritage and certain local authorities.

Whilst these constrain LCR it also gives the freedom to build where construction is acceptable within the defined limits.

[5] "Not Environmentally Worse Than" the scheme that was described in Parliament.

Ian Marley *(Railtrack) asked whether social benefits had been reassessed for Section 2.*

These were not re-appraised but non-financial benefits have been recalculated by Department of trade and Industry and DETR. There are four benefits:

- Half of international passengers.
- Journey time savings of domestic passengers.
- Journey time benefits through regeneration.
- Benefits of decongestion and fewer vehicle emissions.

The Government is seeking to change economic prospects of the Thames Gateway and East Kent. Ten percent of people move house each year and people already discount the value of the house against rail fares. The domestic services will be regulated, unlike Eurostar.

Don Box - *the benefits and costs originally assessed were to the railway as a whole, with a large proportion of benefits accruing to InterCity and freight. The improved cost effectiveness of existing railway services warranted extra subsidy.*

LCR has an obligation to provide the paths. The RDO (Reserve Domestic Operator) could extract passengers from existing services but there could also be a more reliable service on existing lines.

Report by Laurie Baker

The Mayor's Transport Strategy

Henry Abraham, Head of Transport, Greater London Authority

Presentation to Transport Economists' Group
University of Westminster
26th September 2001

The Mayor and the Greater London Authority were established by the GLA Act 1999. The Act specifically sets out eight strategies that the Mayor has to produce:

- Spatial Development
- Transport
- Economic Development
- Air Quality
- Ambient Noise
- Waste Management
- Biodiversity
- Culture

The purpose of the Mayor's Transport Strategy[6] is to:

- Set the context for transport investment
- Be a framework for the boroughs, which is a complex relationship
- Indicate expectations of other partners (not worked out in full yet)
- Provide an Accessibility Action plan
- Encompass all of London's transport – broader than normal strategy and be consistent (demanding requirements)
- Set broad 10-year context, identifying proposals for early development.
- Develop partnership with other key agencies

There is now a moment for opportunity to plan and develop transport in London with the new London government. There should be better integration

[6] The Transport Strategy was published in July 2001 and can be downloaded from www.london.gov.uk

through TfL[7] and strategy, with a new world class management and increased government funding for transport.

The document begins with the challenges facing London such as growing population and employment, increasing congestion. The objectives and linkages are developed followed by description on improving London's transport system. The Strategy sets out policies to a performance framework that sets the detailed proposals in their context.

The scale of the challenge

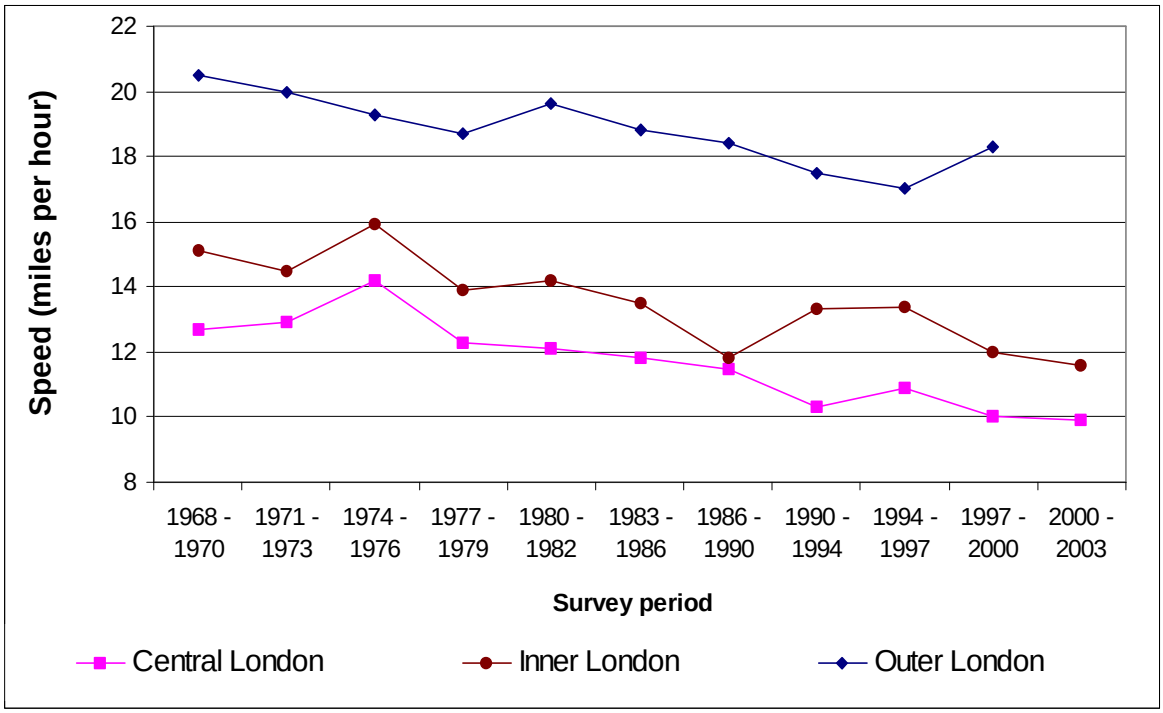
Henry Abraham stressed that this challenge is large! The Strategy has to deal with under-performing and inadequate transport infrastructure:

- Scale (Underground has the same number of passengers as national rail)
- Record travel demand and traffic speeds lowest in UK
- Insufficient customer focus
- Failing London's needs

For example, figure 1 shows the changes of traffic speeds in the morning peak period between 1968 and 2000. Central London speeds average 9.9 mph, Inner London 11.6 mph and Outer London 18.3 mph, reflecting increased congestion throughout this period.

[7] Transport for London

Figure 1: Traffic speeds in the morning peak period, 1968-2000



The speaker used a series of maps to illustrate overcrowding on the Underground, population density and density of employment (which is very concentrated in central London and some town centres).

The transport system is wholly inadequate for the future with:

- growing population
- increased affluence
- increased expectations
- world city competition
- key driver to national economy

Analysis indicates the following changes in peak period demand over the next ten years in the absence of the changes in transport provision in the Strategy:

- Demand for Underground to increase by 16 per cent.
- Demand for National Rail to increase by 15 per cent.
- Demand for bus services to increase by 15 per cent.
- Vehicle traffic to increase by 7½ per cent in outer London, by 4½ per cent in inner London and to remain broadly unchanged in central London.

The following two graphs underline the challenge of growth for transport in London with the growth in population and employment.

Figure 2: Population Trends in London, 1961-2021

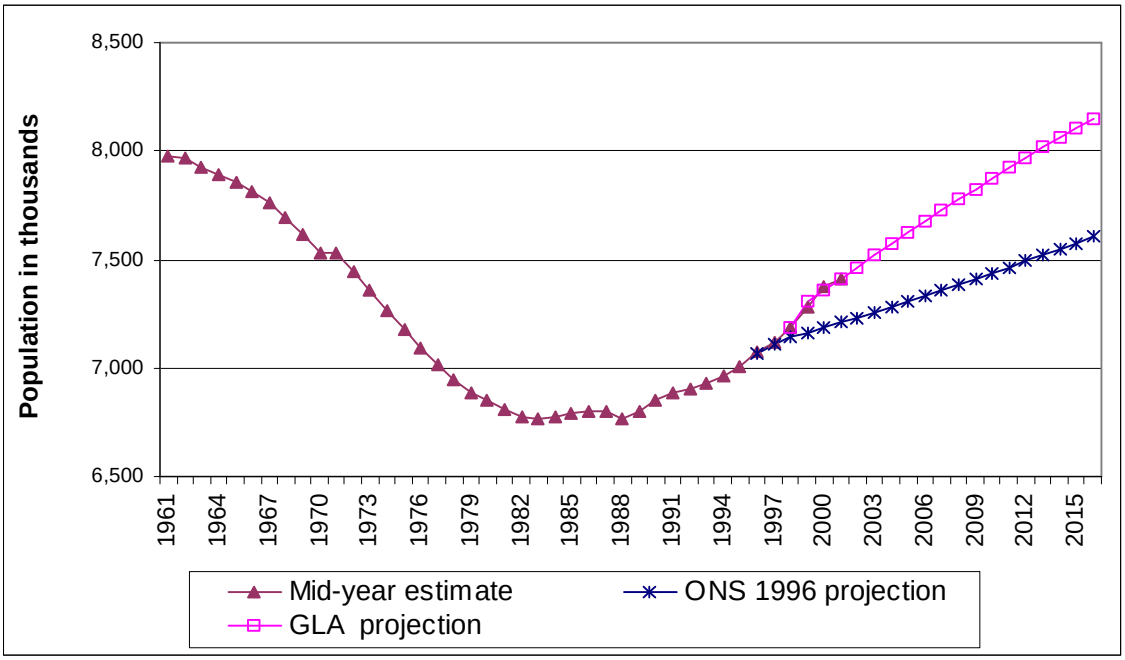
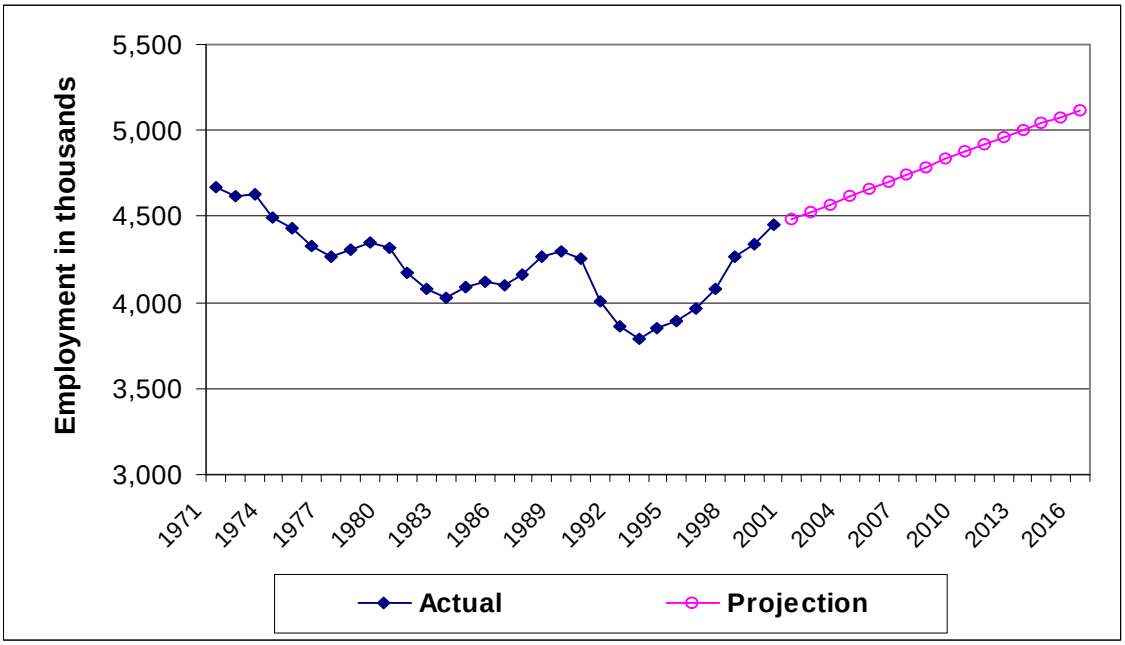


Figure 2 above illustrates population changes between 1961 and 2001 and two projections to 2021. There was a general decline in population to 1983 (from its peak of 8.6 million just before the Second World War). Since 1983 there has been continuous growth, which has accelerated since the early 1990s.

Figure 3 illustrates employment change between 1990 and 2000 and a projection to 2016. There had been decline until 1993, but since then there has been a steady increase in employment to 4½ million in 2001.

Figure 3: Employment in London, 1971-2016



The share of growth to 2011 is predicted to be:

Central London and Isle of Dogs	40%
Inner London	31%
Outer London	29%

The key linkages are:

- Economic development: there are specific proposals for regeneration such as opening up East London
- Spatial development – the development mix, scale, location, access and parking
- Environment and health – cleaner fuels, alternatives to cars, the LEZ (Low Emission Zone) concept.
- Quality of life – tackling congestion, introduction of home zones etc.

Addressing the Key Concerns

The two main issues are traffic congestion and overcrowded public transport. The Mayor wishes to address the need for an integrated approach in London to tackle congestion and poor public transport by increasing the capacity of the transport system, particularly of public transport.

The integrated approach to:

- Tackling traffic congestion
  - Central London congestion charge
  - Better enforcement of parking regulations
  - Co-ordinating streetworks to reduce congestion

- Providing better public transport-
  - Tackle the backlog of investment on the Underground, which will reduce overcrowding and improve reliability
  - Extending the network
  - Extending the bus priority network to whole routes

- Argues against PPP approach because it has nebulous outputs and it will be difficult to see what is done and where it is done.

Figure 4: Sources of lost bus mileage 1992/93 – 1999/2000

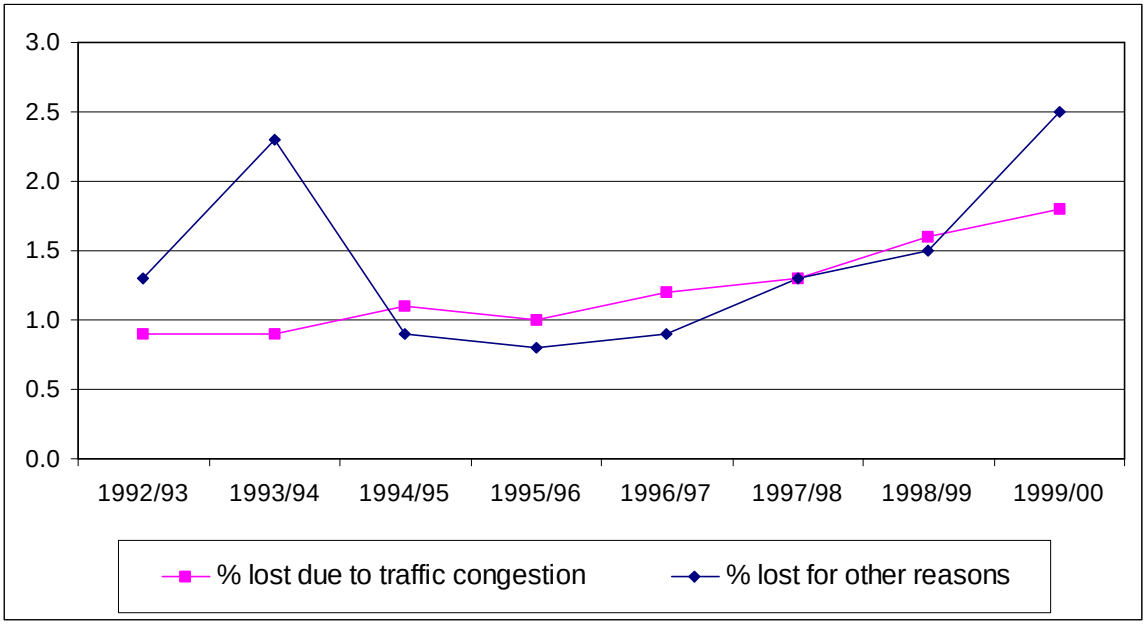


Figure 4 above illustrates lost bus mileage in London during the 1990s. There has been a general worsening of traffic congestion causing lost miles but this has now been overtaken by other causes, of which the most notable is staff shortage.

Methods of addressing the problem of lost mileage include giving staff £20 bonuses to stay in job and providing better buses that tackle:

- unreliability and slow journey speeds

- convenience
- accessibility
- comfort
- cleanliness
- safety
- affordability
- contracts to provide better quality
- attracting staff
- priority and enforcement
- London Bus Initiative[8]

That will lead to a comprehensive, frequent, simple and reliable network.

On National Rail, the Mayor will

- Issue guidance/instructions to SRA
- Produce a Rail Plan for London
- Be involved in re-franchising – quality of service, service levels and infrastructure
- London Metro
- Interchange and station improvement

Other measures

Central London Congestion Charging Scheme in an area bounded by the Inner Ring Road, i.e. Marylebone Road, Euston Road, Pentonville Road, Tower Bridge, Elephant and Castle, Vauxhall Bridge and Victoria. There would be a charge for the use of vehicles on roads within the charging zone, but not for using the Inner Ring Road itself between 7 a.m. to 7 p.m., Monday to Friday except on Public Holidays. The standard charge would be £5 per vehicle per day and there would be exemptions and discounts for a range of vehicles and individuals.

Traffic Reduction Targets for 2011: an absolute reduction in weekday traffic of 15 per cent in central London (through congestion charging), zero growth across the rest of inner London, and reducing growth in outer London by a third, with the aim of achieving zero growth in outer.

[8] See The Transport Economist Vol. 28 (2) Summer 2001 "The London Bus Initiative Partnership", a talk given by Zyg Kowalczyk in January 2001

Road Safety Reduction with additional targets in London of:

- A 40 per cent reduction in the number of pedestrians killed or seriously injured in road acciden7ts.
- A 40 per cent reduction in the number of cyclists killed or seriously injured in road accidents.
- A 40 per cent reduction in the number of motorcyclists killed or seriously injured in road accidents.

Major projects

Cross-London rail links:

	Earliest completion date
Thameslink 2000	2008
Crossrail (and to Heathrow)	2011
Hackney – South West	2015

Improved rail links: include East London Line extensions to north and south that will extend into "OrbiRail", based on a core Inner London orbital rail network.

Intermediate Mode Schemes[9]: four proposals, which all involve considerable road space reallocation:

- East London Transit
- Greenwich Waterfront Transit
- Uxbridge Road Transit
- Cross River Transit

New River Crossings are proposed in East London:

- A rail crossing at Woolwich which could be an extension of the North London Line or the Docklands Light Railway (DLR);
- A bridge between Barking and Thamesmead, which would have dedicated lanes for public transport, possibly intermediate modes;
- A road bridge or tunnel between North Greenwich and Silvertown (third Blackwall crossing).

[9] See Transport Economist Vol. 28 (2), Summer 2001: "Intermediate Modes in London" a talk by Jon Willis given in March 2001.

Public transport capacity between 2001-11 will be increased:

+40% Bus

+50% Rail and Underground.

Financial approach: look at needs first, then decide how to fund – more government and private finance. Also, there is a broad framework of performance monitoring.

Discussion

A short period of discussion took place before the speaker had to leave.

Michael Woods *(AEA Technology) remarked that he was very impressed by the consultation. Have the results been analysed and published.* HA said that the results were analysed by MORI and can be seen on the GLA website (www.london.gov.uk). It was a very substantial task but the Strategy is all the better for having done it.

Robert Cochrane *(independent) Very real problems, proposals for taking forward within the institutional framework greater local democratic power.* It is a good thing for London since it was becoming hard to make voice heard for London. Bringing in Bob Kiley reflects local accountable and a willingness to take risks.

Report by Laurie Baker

Data sources for figures:

Figure 1: *Transport Statistics for London 2001,* Transport for London 2001

Figures 2 and 3: *Planning for London's Growth, Statistical Basis for the Mayor's Spatial Development Strategy,* Greater London Authority, March 2002

Figure 4: *Service Performance Reviews: Fourth Quarter, January to March each year,* London Transport

The Debate on the Economics of Rail Safety

Professor Andrew Evans,
Centre for Transport Studies, University College London

Talk given to the Transport Economists' Group
University College, London
28th November 2001

Outline

Professor Evans began his talk by setting out the facts on fatalities, fatality rates, fatal transport accidents and train accidents on the national rail system. He then discussed the valuation of the prevention of fatalities, followed by the dilemma over train protection.

Table 1 sets out the current fatalities per year for different types of incident.

Table 1: National rail accident fatalities per year: late 1990s

	Fatalities per year
ATP[10]-preventable (mostly SPAD[11])	2.2
Other train collisions and derailments	2
Falls from train doors	4
Fatalities at stations	14
Trackside workers	3
Level crossings	10
Passenger trespassers	7
Total excluding public trespassers	**42**
Public trespassers (excluding suspected suicides)	52
Total	**94**

Source: Sir David Davies: February 2000

[10] ATP - Automatic Train Protection
[11] SPAD - Signal Passed at Danger

The first two in the table are the high-profile accident types, which represent 10% of the average 42 fatalities per year (excluding public trespassers) on the railways. This can be compared to over 3,400 road fatalities in 2000 (table 2).

Table 2: Number of road accident fatalities: 2000	
	Fatalities
Pedestrians	857
Pedal cyclists	127
Two wheel motor vehicle users	605
Other road users	1,820
Total	**3,409**

Fatality rates by mode per passenger kilometre and passenger hour are given in table 3. The figures indicate that the most vulnerable transport modes are walking, cycling and two-wheeled motor vehicles. All types of public transport are lower than road users but rail has recently had the highest fatality rate of the public transport modes.

Table 3: Passenger transport fatality risk per kilometre and per hour in Great Britain: 1990s		
Mode	**Fatalities per billion pass-km**	**Fatalities per billion pass-hour**
Air	0.02	10
Water	0.3	7
Bus/coach	0.4	9
Rail	0.5	27
Van	1.0	47
Car	2.8	117
Pedal cycle	41	520
Foot	49	190
Two-wheeled MV	112	4,450

Source: *DTLR,*
air, water, bus/coach, rail - average 1990-99
others 1999

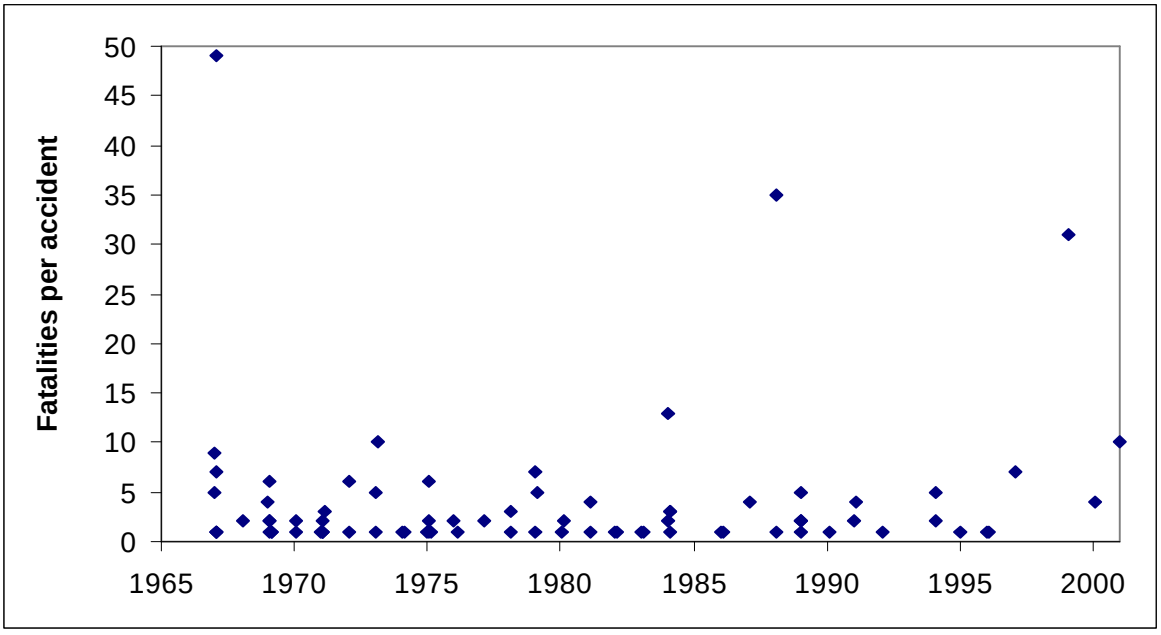
Fatal train collisions and derailments on National System: 1967-2000

Over the 35 years between 1967 and 2001 there have been 78 collisions and derailments with 318 fatalities on the national rail system. Of these, six had 10 or more fatalities (a total of 148 fatalities - 46%). During that period there have been three very serious accidents:

- Hither Green 1967: 49 fatalities
- Clapham Junction 1988: 35 fatalities
- Ladbroke Grove 1999: 31 fatalities

The average number of fatalities per fatal accident is four and there is no obvious increase over time as shown in figure 1:

Figure 1: Fatalities in fatal train accidents, Great Britain 1967-2001



Andrew Evans presented accidents per train-kilometre, subdivided by cause (table 4). There is a generally downward trend, but…

- The rate of fatal conflicting movement SPADs is constant (i.e. not falling).
- Railway Safety thinks the risks are higher than statistics suggest.

No statistical change is evident following rail privatisation.

Table 4: Trends and mean fatal train accident rates: national rail system		
Type of accident	**Trend in mean accidents per train-km**	**Estimated mean accident rates for 2000**
Conflicting movement SPADs	+0.7% pa	0.57
Plain line SPADs	-10.3% pa	0.03
Other ATP-preventable	-12.8% pa	0.02
Non-ATP-preventable	-5.0% pa	0.61
All accidents		**1.23**
Fatalities per fatal accident		4.0
Fatalities per year		**4.9**

Source: Evans (2001)

The Valuation of Preventing Fatalities

Valuations for preventing road casualties were originally developed for COBA[12] appraisals of road proposals. The road valuations have been in use for about 40 years in Great Britain and are annually updated. Many other countries also use road valuations. Values and methods differ although there has been a convergence, with GB figures at the high end of the range.

Valuation is not of any specific person's life, but of the collective value of small reductions in risk to a large number of people, which are expected to prevent one fatality among them. The value is estimated by the so-called 'willingness to pay' approach using surveys. The history of road valuations is given in table 5.

The 1985 valuation is based on human capital, i.e. lost output, which is now not approved because people value their life and limb for other reasons besides their output. 1988 saw a change to a "willingness to pay" approach to valuation; the valuations were then inflated by the index of GDP per head. In 1998 there was another look at the valuation when it was agreed to increase it by 10%.

[12] COBA - Cost Benefit Analysis

Table 5: Official valuations of preventing road fatalities: 1985-2000		
	£ million at 2000 prices	**Index (1985=100)**
1985	0.46	100
1988	*0.87	190
1989	0.89	195
1990	0.90	198
1992	0.87	192
1993	0.88	194
1994	0.92	202
1995	0.93	204
1996	0.94	206
1997	0.97	213
1998	*1.09	240
1999	1.12	246
2000	1.14	251

*Estimated after fresh research

Valuations were extended to appraisal of rail safety measure in early 1990s as shown in table 6 below

Table 6: Official valuations of preventing fatalities: 2001	
	Value of preventing fatality (£million)
On the road (Projection of DTLR series)	1.20
On railways:	
Fatalities in train accidents	3.35
Other fatalities	1.20

Source: Railway Group Safety Plan: 2001/02

The relatively high figure of £3.35m for train accident fatalities was based on the judgmental argument that people are willing to pay more when not in control and more to reduce the risk of "large" accidents.

Recent research findings on the relative value of preventing road and rail fatalities are shown in table 7 below:

Table 7: Research findings on value of preventing rail fatalities relative to road fatalities.

Date and location of surveys	Mean value of preventing rail fatality relative to road fatality
Oct/Nov 1998 (non-London area)	0.83
Jan/Feb 2000 (St Albans, Guildford, Reading)	
All respondents	1.00
Regular rail users	1.17

Source: Michael Jones-Lee *et al* (2000) for DETR, HSE and Home Office

These results do not support the adoption of a higher valuation for fatalities in train accidents. Even regular rail users in early 2000, in the aftermath of the Ladbroke Grove accident, valued the prevention of rail fatalities only slightly more than road fatalities

The Dilemma over Train Protection

Until the 1980s, railways relied on the driver to perceive signals and avoid SPADs – with some aids such as audible automatic warning systems that need to be acknowledged by the driver. Train protection devices are technical methods to prevent SPADs, developed in a modern form from late 1980s to monitor speed against conditions. SPADs are infrequent for most drivers, but persistent overall with:

- A fatal SPAD accident occurs about once in 2 years
- Non-fatal but non-trivial SPADs not reducing

Are we now at limit of human capability? SPADs are infrequent but persistent and are unlikely to improve unless something is done. The dilemma is that:

- Not installing train protection means that preventable accidents and casualties will happen.
- Installing train protection has cost above evidence of value; also resources could be deployed to save more casualties in other ways.

Train protection in GB started with BR's Automatic Train Protection (BR-ATP). The Train Protection and Warning System (TPWS), which is now being installed, is estimated to be able to prevent 70% of ATP-preventable casualties.

A new system - European Train Control System (ETCS) - is a modern version of ATP that is being promoted by Europe for interoperability of national railway systems. Table 8 presents the costs of these systems, and compares them with the values above.

Table 8: Valuations and costs of preventing fatalities: 2001 price level	
	£ million
Values of preventing fatalities	
Road, basic railway	1.20
Adopted for train accidents	3.35
Costs of preventing fatalities	
In well-designed road safety schemes	0.1
By BR-ATP (rejected)	13
By rail TPWS (in progress)	5-10
By further train protection measures (e.g. ETCS)	0-?50

Discussion

Peter Gordon (AEAT Rail) *suggested that if people wanted to arrive alive and were totally rational, they would b more concerned about the road than the rail part of their journeys.* There is a large amount of political pressure and media interest in rail risk, but 90% of the risk of a train journey is getting to/from the railway station.

Trespassers are the largest category of casualties with 250-300 of which 52% are suicides.

Britain's railway is the only in Europe that is legally required to be fenced. It is not known how many of the people who are killed on tracks are suicides, since coroners are reluctant to record this unless there is strong evidence for it.

Michael Woods (AEAT Rail) *suggested that a large proportion of trespassers and vandals get on tracks via stations, which has led to suggestion of fencing at end of platforms and more staff.*

John Dodgson (NERA) *asked where are we up to with TPWS and how much is the completed cost?*

Deadline is completion in 2004 at a cost of £500 million although costs are creeping up. ETCS is required to be installed on high-speed lines (East Coast,

West Coast, Great Western when re-signalled and on the Channel tunnel Rail Link). The standards for inter-operability being worked on now but there is still room for debate. It is not sensible to put the new system on old signals.

John Cartledge (LTUC) *suggested that the kit on the track and train have to be compatible when used by different trains on the same track. TPWS is 100% effective up to 70 mph and can be adapted to 100 mph. Therefore it is effective on most railways in Britain.*

Mervyn Johns *enquired about comparisons with other railways in costs of fitting systems.*

There is no doubt about fitting the system to new high-speed lines since the marginal cost is very low.

Don Box *opined that investment takes years to debate but when it is built it is there for a very long time. What is the feasibility of putting in ETCS?*

TPWS is not upgradable and there will no application of BR-ATP. After that, everything will be European standard.

Marie-Ann Wiley (Antspire Ltd): *1. A lot of accidents are caused by a number of things going wrong simultaneously, very often by non-observance of existing protection mechanisms. The statistics do not distinguish non-observance and absence.*

2. Multiple causes associated with high death rates (e.g. Ladbroke grove).

3. The talk concentrated on SPADS, but more people are killed for other reasons. Is there not a need to concentrate on reducing the other 40 deaths per year?

There is human error in all accidents and safety measures have to take that into account. Inquiry recommendations are trying to prevent making the same mistake again. Very often it is a management problem, not a technological one.

Report by Laurie Baker

Forecasting Transport Demand

A seminar held jointly with Transport Planning Society

Institution of Civil Engineers, One Great George Street
8th February 2001

The seminar consisted of four presentations:

NRTF - from a road traffic forecast to a strategic policy model
Tom Worsley (DETR)

Forecasting in London
Mick Roberts (MVA)

Forecasting Travel in the Rail Industry
Daniel Livingstone (SRA)

Modelling for Local Authorities' Transport Schemes
Professor Marcial Echenique

Below is a summary of the first presentation by Tom Worsley, Head of Highways Economics and Traffic Appraisal, DETR.

NRTF[13]: From a Road Traffic Forecast to a Strategic Policy Model

Tom Worsley's talk covered the development of road traffic forecasts, taking into account the:

- National Road Traffic forecasts before 1997
- Supply side response in the 1997 forecasts
- Development of the policy response mechanism
- Use of the 1997 NRTF for the 10-Year Plan
- Recent developments and proposals.

Forecasts before 1997

All forecasts before 1997 followed a similar approach: car ownership was determined by household income, with saturation imposed, and average

[13] National Road Traffic Forecasts

mileage per car was a function of motoring costs and goods vehicle traffic of GDP. To this was added an assessment of past forecasting record.

Uses of NRTF forecasts prior to the 1990s

Prior to the 1990s, forecasts were used as input into road design and appraisal. Since then, local models and forecasts, relying on common parameters published in HEN2[14] gradually supplemented this use. NRTF forecasts were also used for general information on the future rate of traffic growth and car ownership.

Reasons for revisions to NRTF – 1969-1989

The actual value of input variables was falling outside the range used in the NRT forecasts and methodology was changing. In 1977 the ACTRA[15] reported (the Leitch report), recommending changes to the method of appraising trunk road schemes to take into account economic and environmental factors. It also considered comparisons with investment in alternative methods of transport. Car ownership at this time was also increasing rapidly.

Supply Side Response in the 1997 forecasts

It is considered that the 1989 forecasts must be wrong since no more traffic can physically fit on the M25 during the peak. The development of "fitting-on" included speed/flow curves, elasticity responses to longer journey times and area types and regions.

The 1997 forecasts were published as part of transport white paper consultation. They were not initially intended as a strategic policy model.

The DETR had commissioned a specification for a Transport Policy Model – but DETR policy users were unwilling to commit the staff and financial resources to its development.

The forecasts predicted that the increase in travel times had only a small impact on total traffic.

Developments

[14] Highways Economics Note 2 provides values of time and vehicle operating costs for use in economic appraisals. This has been superseded by Transport Economics Note, DTLR, March 2001.

[15] The Advisory Committee on Trunk Road Appraisal. This later became SACTRA - the Standing ACTRA.

- The discussion on the Road Traffic Reduction Act was about reducing road traffic or reducing its adverse effects.
    - Potential for using NRTF to compare policy options and to measure outcomes.
    - Conversion of the NRTF journey time responses into changes in generalised cost.
    - Measure of congestion – difference between free flow and modelled speeds.
    - Estimates of changes in congestion and changes in emissions, both CO_2 and concentrations of PM_{10} and NOx.

Transport Ten-Year Plan: model form

Further modifications were made to the model:

- New econometric rail passenger demand model, with a car traffic variable.
- Add-on relationship between rail investment and transfer from car.
- Rail freight model, capturing trips from road, influencing road congestion and emissions.
- Rail emissions model.
- Local action module; expenditure, travel costs and traffic from a range of studies/models.
- Improved modelling of local transport measures through 'traffic change factors'.
- Modifications to model better capacity changes.

Transport Ten Year Plan: input assumptions

- GDP, population and household projections, constant oil prices.
- Improvements in:
    - vehicle efficiency reduce the cost per mile driven by 2010.
    - Road haulage efficiency.
- New base case similar to NRTF 1997.

Transport Ten Year Plan: policies assumed

- Infrastructure investment in trunk roads, and interurban and London rail.
- Local transport policies and investment, including some congestion charging.
- Sustainable freight distribution.
- Railfreight.

Transport Ten Year Plan – illustrative scenarios

- More local authorities adopt congestion charging.
- Inter-urban trunk road charging.
- Constant motoring costs.

These are reflected in the following two diagrams, which show the growth in transport demand (Figure 1) and of congestion (figure 2). Both diagrams show the change from today (1997) and 2010 with a baseline, the implementation of the Plan and the Plan plus illustrative scenarios listed above.

Figure 1: Change in Transport Demand 2000 to 2010

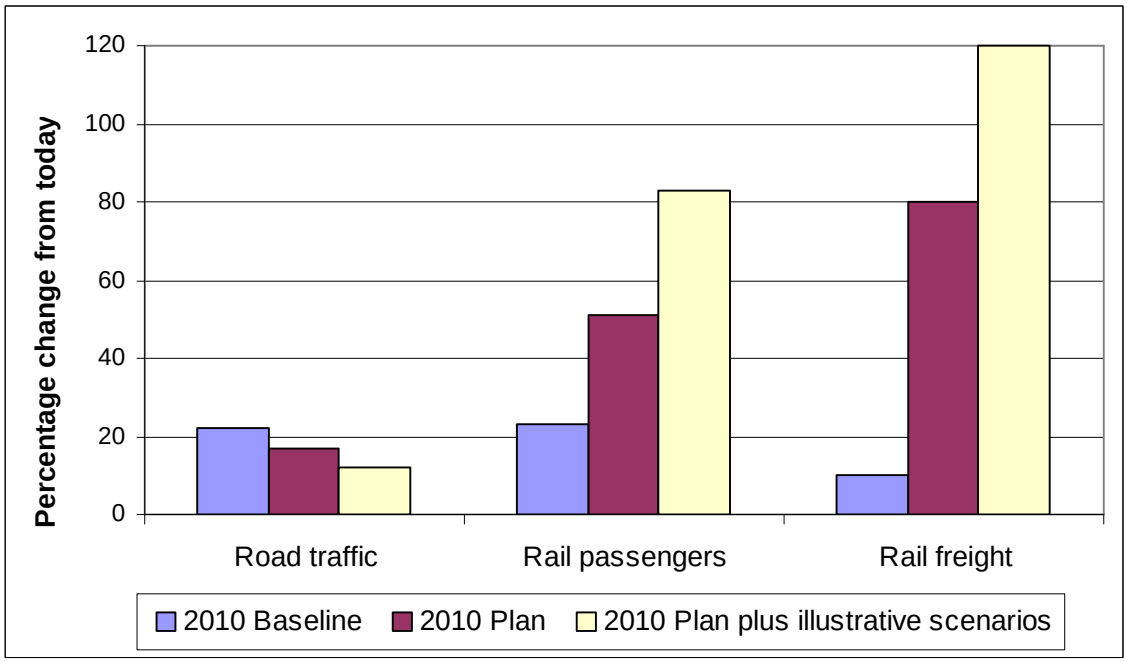


Figure 2: Change in Congestion 2000-2010

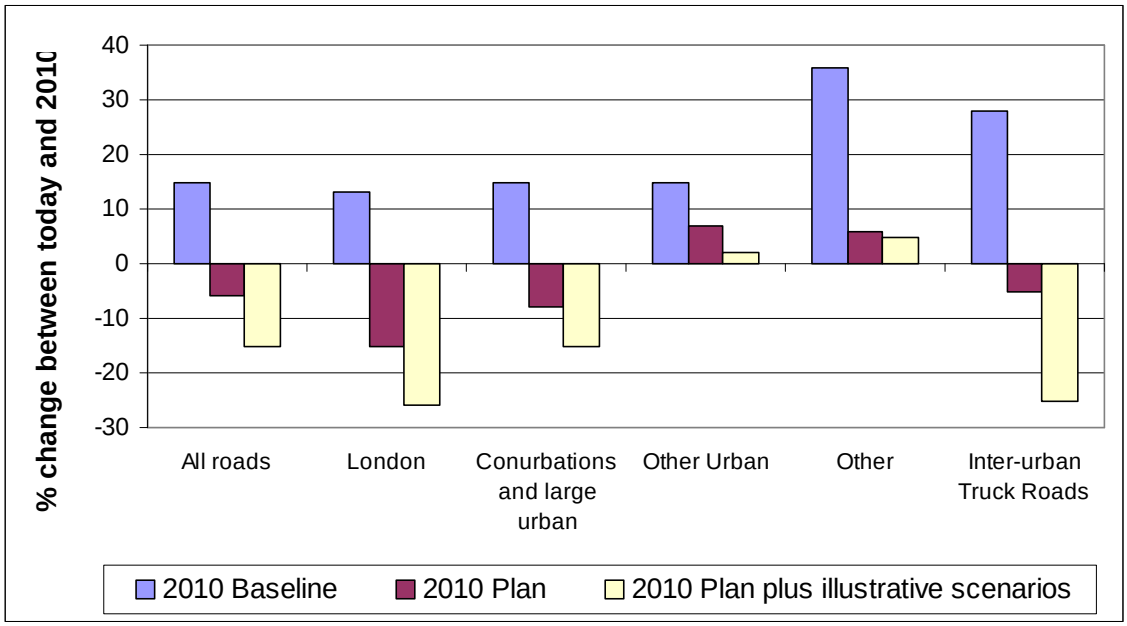


Table 1 shows how the plan components contribute to a reduction in congestion.

Table 1: Contribution of plan components

(Assuming all other components implemented)	Reduction in congestion	
	All roads (Plan total 22%)	Trunk roads (Plan total 33%)
Local transport	3	3
London	3	0
Passenger rail	1	1
Rail freight	0.4	2
Sustainable distribution	0.5	1
Inter-urban trunk roads	3	13

Developments of the model

Those in hand to improve the model

The new model starts with trips by persons, and then models mode split and trip length using Family Expenditure Survey car ownership and National Travel Survey data, by area types. The model is sensitive to cost data for analysing the

impact of 'general' policies on mode choice etc. The model has the following steps:

- A matrix of car trips by distance-band between/within area types.
    - The synthetic car trip matrix then assigned to a 'real' road network to show road use by road type.
    - Trips x profiles gives overall growth by region and road type.
    - Responses due to changes in road network are related generalised costs.
    - This feeds back into the trip-making model, and is run again to provide final outputs.

Further developments

The rail model will look at the impact of rail investment on demand, feedback into area type/distance based trip matrix and the mode split effect.

A Review of NRTF will look at deficiencies in forecasting, and the scope for immediate improvement and for longer-term improvement.

In the short-term further generalised costs/policy responses will be incorporated to improve reliability, accidents, further extensive sensitivity tests and provide documentation.

Longer-term improvements include better spatial representation, on reaching an equilibrium, freight (road and rail, light and heavy road goods vehicles) and land use/transport interactions.

Conclusions

In conclusion Tom Worsley said there was scope for improvements and would welcome comment/suggestions. Circumstances dictated that the only way forward is an evolutionary process.

Major expenditure and policy planning was underpinned by modelling/analysis so that modelling is taken seriously in strategic decisions.

It is, therefore, a good time to be a modeller!

TEG NEWS

There is no TEG news this issue. The next issue will include a report of the AGM held on 20th March. This will include the audited accounts and the new committee for 2002/03.