Transport Scenarios for Scotland 2000-2030

A Review and Update of
Transport Policy Options for a Sustainable Scotland 2000-2020
An Assessment of Three Scenarios (published 1999)

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Draft Discussion Paper

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SUMMARY

Parts 1 & 2 outline the original 1999 report by Tom Hart and Nigel Doar on *Transport Scenarios for A Sustainable Scotland : 2000-2020.* In **Part 3**, the present report reviews actual outcomes. The main conclusion of the 1999 Report was that only Scenario 3 was likely to stabilise total movement and deliver a significant shift to public transport, walking and cycling. Scenario 3 also aimed for a 40% cut in greenhouse gas emissions and gave the greatest gains for the economy and well-being. Actual outcomes to 2015, extended to 2020 (Table 5), show stable movement per head since 2000 but total movement is up 7.7% mainly due to population growth in Scotland. Modal shift to public transport, walking and cycling is below Scenario 3 estimates with a lesser shift from prior trends and carbon emissions from internal transport unlikely to fall more than 15% by 2020.

Modal Share	**2000**	**2020**	
	Actual	Scenario 3 (1999 Report)	Revised Expectation
Walk/cycle	3.9%	8%	6%
Public Transport (land-based)	13.1%	31%	19%
Car	79%	58%	71%
Other (air, ferry)	4%	3%	4%

Part 4 (paras. 1-23) analyses these changes and sees changes in consumer preferences and technology as the main factors behind stabilised internal movement per head of population. The slower, but still significant, shift to public transport, walking and cycling is explained by prevailing government preferences (included in Scenario 1) for investment, pricing, fiscal, land use and regulatory options favouring car use to a greater extent than consumer preferences to shift from private car use. At Paras 4.24 to 4.39, Part 4 considers whether measures to encourage modal shift as in Scenario 3 are *Desirable* or *Detrimental to the Economy and Well-being*. It concludes that changes in consumer, business and government preferences continue to indicate (despite the recent sharp fall in oil prices) a relative shift from spending on motor vehicles and transport infrastructure to other parts of the economy as part of programmes to improve overall efficiency, health, well-being and cuts of at least 25% in net fossil fuel in internal transport between 2020 and 2030 together with other improvements in air quality, city and tourist ambience.

Part 5 considers revised Scenarios for 2020-30. It favours an amalgam of ***'Decide and Provide'*** and decentralised ***'Market'*** approaches rather than a discredited '***Predict and Provide'*** approach. The outcomes are likely to be a rise in the public transport/active travel share of Scottish internal movement from 29% in 2020 to 37% by 2030 with the car share down from 71% to 63%. (Para 5.20 and Table 7 in Appendix 2). Some shifts from households with one or more cars will be directly to public transport or active travel. But there are also indications of a fall in households with one or more cars always available, accompanied by rising use of car hire and car club facilities, especially among city residents. In relation to transport spending, cost-effective phased packages for improvement should be favoured rather than a focus on major projects (Appendix 2)

Part 6 lists **Ten Recommendations** for early changes in Scottish Government, Regional Transport Partnership and Local Authority approaches to transport. These include:-

- verification or adjustment by autumn 2015 of 2000-15 data and projections to 2020
- evaluation of broader brush Scenarios to 2030 and beyond with a preferred Scenario and Action Programme adopted by autumn 2016 but reviewed every five years
- early application of road fuel duties above inflation if annual petrol/derv consumption falls by less than 1.5% but lower duties if annual consumption falls by more than 2%
- a study of longer-term options for the funding and pricing of transport and access programmes within targets for overall cuts in greenhouse gas emissions and improved air quality
- greater devolution in transport and access decision taking and related funding

1 Introduction

1.1 The 1999 Report examined three Scenarios for changes in Movement and Modal Share in Scotland over the period 2000-2020. Special attention was given to changing relationships between transport, the economy and the environment – including impacts on natural and manmade heritage and the scope for substantial cuts in greenhouse gas emissions from the transport sector. Scenario 1 examined *Modified Business Usual*, Scenario 2 *Accelerated Modal Shift* and Scenario 3 *Reducing the Need for Movement.* For total movement, actual outcomes to 2015 have been close to Scenario 3 but with differing reasons from those given in 1999.

1.2 With new factors affecting changes in movement and the nature of relationships with the economy and society, it is timely to consider a revised Scenario approach to the period 2015-40 with a particular focus on the coming 15 years. Account is also taken of the changing nature of governance and the revival of worldwide interest, despite the short-term gains from lower oil prices, in a phased trajectory to low net global carbon emissions by the mid 21st century.

2 Outline of 2000-2020 Report

2.1 The Report considered how far different Transport Scenarios could contribute towards targets for 35% cuts in UK greenhouse gas emissions by 2020 while also strengthening the economy and quality of life (re-defined to include feelings of well-being). The conclusions were that:-

Scenario 1 would see a 41% rise in total movement and in transport CO2 emissions
Scenario 2 would see a 22% rise in total movement and a lower rise in transport CO2
Scenario 3 would see stability in total movement and a 40% cut in transport CO2

These estimates excluded external travel by air and exports/imports from and to Scotland. They related to movement measured in passenger and tonne kilometres within Scotland

2.2 Only Scenario 3 met UK targets for greenhouse gas emissions with the other Scenarios requiring greater cuts in sectors outwith transport to deliver an UK overall 35% cut in carbon emissions. Scenario 3 also gave the greatest benefits for the economy and society

2.3 In defining the Scenarios, the overall assumption was of a stable Scottish population but with Scenario 1 having a larger shift to Dispersed Urban living and Scenarios 2 and 3 leaning, to differing degrees, towards more compact urban living. Scenarios 2 and 3 also included assumptions of greater changes in fiscal, pricing, traffic management and infrastructure investment policies to encourage greater shifts to public transport, walking and cycling.

2.4 Changes in passenger movement were estimated by aggregating separate forecasts of movement within Dispersed Urban, Compact Urban and Rural Areas (including through flows). The resulting forecasts of modal share across Scotland were:-

TABLE 1	**2000**	**2020**		
		Scenario 1	Scenario 2	Scenario 3
Walk/cycle	3.9%	3.2%	4.7%	8.0%
Car driver	48.3%	48.2%	41.3%	33.3%
passenger	30.7%	30.6%	28.8%	24.5%
Bus/taxi/DRT	9.3%	8.3%	11.5%	15.7%
Rail	3.8%	6.3%	9.9%	15.4%
Other (inc.ferry,air)	4.0%	3.4%	3.8%	3.1%
In compact urban areas, walk/cycle share		*9.5%*	*13.1%*	*20.7%*
public transport share		*18.6%*	*24.3%*	*34.8%*

3 Actual Outcomes 2000-2015

3.1 Reporting actual outcomes is affected by delays in data becoming available and deficiencies in collection. Full data for 2015 will not be available until several months into 2016. The assumptions made in preparing the Tables 2 & 3 are in **APPENDIX 1**. There is no doubt that actual movement per head within Scotland has stayed almost stable but with a historic trend shift in mode share towards public transport, especially rail, plus growth in walking and cycling. Indeed, rail passenger use, in common with the rest of Britain, has risen at its highest rate since the first decade of the 20th century and is at an all-time high.

Table 2 Total Passenger Movement in Scotland (million passenger kilometres)

	2000	**% share**	**2015**	**% share**
Car Driver	31,433	48.3%	34,500	49.3%
Car Passenger	20,067	30.7%	17,000	24.2%
Scheduled Bus & Coach	5,280	8.1%	6,500	9.3%
Taxi/DRT/car/bus/coach hire	800	1.2	1,500	2.1%
Rail	2,480	3.8%	3,930	5.6%
Walking	2,000	3.1%	2,500	3.6%
Cycling	500	0.8%	1,400	2.0%
Other(mainly ferry & air)	2,400	4.0%	2,700	3.9%
TOTAL	**64,960**		**70,030**	

Table 3 Data from Scottish Transport Statistics No 32 2013 Edition

Motor Vehicle Numbers and Selected Average Daily Road Vehicle Flows (thousands)

	2001	**2007**	**2012**
Road Motor Vehicles	2.3m	2.6m	2.7m
of which cars	1.9m	2.2m	2.3m
A74 (M) Lockerbie	30,998	33.066	30,902
M8 Harthill	50,000(est)	51,628	50,170
A720 Dreghorn (Edinburgh Bypass)	67,062	80,448	75,697
M9 Kelty	28,536	30,000(est)	31,286
A9 Blackford	22,680	26,888	24,672
A9 Tomatin	7,000(est)	9,110	8,453
A90 Stonehaven	22,969	26,045	25,796
A77 Kilmarnock	23,961	27,984	25,876
A77 Glen App	2,937	3,579	3,483
A1 Grantshouse	6,754	8,989	8,284
Anglo/Scottish Rail Passengers	5.0m	5.8m	7.8m
ScotRail passengers	60.8m	74.5m	83.3m
Scottish Household Survey			
% not walking in sample week	45%(2002)	48%	34%
% walking to school	55.5%(2002)	52.8%	51.4%
% working from home	9.3%	11.2%	13.2%

3.2 Table 2 shows a 7.7% rise in passenger movement in Scotland between 2000 and 2015 compared to an overall stability of movement between 2000 and 2020 in Scenario 3. However most of this 7.7% rise can be attributed to the 6% rise in Scottish **population** between 2000 and 2015 with some further growth likely by 2020. Using the measure of movement per head of population, it seems probable that there will be continuing stability in movement. (The original Scenario 3 assumed stability in the Scottish population)

3.3 Table 2 also highlights the fact that movement by car has been accompanied by a significant fall in **average car occupancy**. Had occupancy rates stayed stable, or risen, car vehicle miles could have been stable even after allowing for some rise in population. Though the overall level of passenger movement per head in Scotland has stayed stable – unlike previous decades – the degree of shift to public transport and active travel has been closer to Scenario 2 than Scenario 3 with further action between 2015 and 2020 unlikely to deliver the degree of mode shift in Scenario 3. Yet, in rising from a 16.9% share of passenger movement in 2000 to 22.6% by 2015, public transport and active travel have seen an increasing share of movement, contrasting with previous years.

3.4 With respect to **freight tonne kilometres,** the situation is shown in Table 4 which has still to be updated beyond 2010 *(Source STS No 32 2013 edition Table 3.2 (road) and 7.12 & 7.13 (rail)*

Table 4 Freight Movement (million tonne kilometres)

	2000	**2007**	**2010**
By road within Scotland	8,088	8,632	7,173
to other destinations	6,700	6,717	5,522
from outside origins	7,623	8,010	6,302
By rail (all origins and destinations)	4,099	4,259	3,280

3.5 This Table shows a lower fall in total road freight movement in Scotland than in freight movement to and from Scotland. Rail freight within Scotland rose from a low base but total rail freight fell due to the sharp fall in coal movement to England after a peak in 2005. Imported commodity tonne kilometres by rail showed almost 50% growth between 2001 and 2010. This reflects some shift of imports by HGVs on the A74(M) from road to rail but Scottish exports (exclusive of oil) made greater use of ports (which also handled some rise in bulk imports). The port of Grangemouth, with both road and rail connections, has seen a recent record in the number of 4,200 containers handled per week *(H 29 Nov.,2014)* but many container flows to and from Scotland are via ports in England.

Emission Reductions

3.6 Total greenhouse emissions from cars started to fall from 2007 with a 9.5% cut by 2011 (and a probable 12.5% cut by 2015). The Bus, HGV, Light Goods Vehicle, Aviation and Shipping sectors have had broadly stable emissions since 2007. Aided by electrification, total rail emissions are one-third of the bus and coach total. Rising rail passenger use has cut emissions per passenger kilometre (Scottish Transport Statistics No 32, 2013 edition; Figure 13.2 – which notes that allocation problems affect some of this data). Actual 2000-20 cuts in the internal transport sector are likely to be no more than 15% compared to the 40% cut aimed for in Scenario 3 in the 1999 Report.

3.7 Emissions of carbon monoxide, particulates and nitrogen oxide continue to be higher than required standards, especially in parts of the larger Scottish cities.

Fiscal, Pricing, Infrastructure and Regulatory Issues

3.8 The 1999 Report outlined both some **assumptions common to all Scenarios** and assumptions where Scenarios diverged. The common assumptions included:-

- aviation taxation
- fossil fuel or energy taxation (with proceeds used to reduce other taxes)
- tax levies on greenfield development and on parking spaces in urbanised zones
- phased move to variable electronic road pricing on major roads in conjunction with a lowering of 'deep rural' transport fuel costs relative to urbanised zones
- greater 'transparency' in transport accounts and regional devolution within Scotland
- 50% cut in road deaths and serious injuries by 2020
- extended use of 20mph speed limits on residential streets and selected scenic areas
- reductions in road congestion and improved reliability
- vehicle access improvements under Disability Discrimination Act 1995
- reforms in public transport regulation to improve co-ordination, modal shift from cars and the introduction of smart, integrated ticketing

3.9 The reality is that most of these common assumptions (apart from improved road safety and less congestion) have either not been applied or applied only in part. Even in 2015, there is a lack of focus on consistent reforms in transport pricing and ticketing to improve incentives for shifts from car use. A fuel tax escalator (increasing motor fuel taxation beyond rates of inflation) was introduced but subsequently abandoned. Since 2010 motor fuel taxation has fallen in real terms despite a stated government intention to raise fuel taxation if oil prices fell but ease it when prices were high. Pump prices by early 2015 were lower than in 2009 due to the easing of taxation and the unexpectedly sharp fall in base prices from the summer of 2014. Rather than introducing peak charges, all tolls were abolished on the Skye, Erskine Tay and Forth Bridges with significant loss of income to government at a time of rising pressure on public funding.

3.10 Little progress was made in developing a stronger approach and common standards for local public transport regulation, improved co-ordination and easy interchange. Park and ride – almost entirely free of charge, saw substantial expansion but also posed a threat to existing bus services rather than being part of a strategy for cost-effective networks and interchange hubs. Apart from the largest cities, and especially Edinburgh, there was limited progress in raising net income from parking and reducing commuter and other long-stay parking in, or close to, city and town centres. This was also been influenced by the reluctance to consider parking levies at supermarkets and other out of town or fringe of town centres for employment, shopping and entertainment.

3.11 A tax on Air Passenger Travel was introduced but has proved unpopular since people flying to and from Scotland but using hubs in England have faced extra charges. This tax is now being devolved with growing pressure on the Scottish Government to reduce or eliminate it – but this would involve a further loss of income at a time of spending restraint. The extension across Scotland of free bus travel for the elderly or disabled has also involved substantial support from public funds (and some loss of rail income) compared to alternative, and arguably fairer, options.

3.12 Similar problems have arisen in relation to the costs, and summer frustration, of extending Road Equivalent Ferry Tariffs to most of the Scottish islands. More ships, or priority booking systems, will be required to cope with increased ferry use at summer and week-end peaks. Some relief has been introduced to ease 'deep rural' petrol and derv prices but this falls well short of a more fundamental reform of road, bus, rail and ferry pricing

Divergent Elements in the Three Scenarios

3.13 Actual developments since 2000 have remained much closer to Scenario 1 specifications than to those of Scenarios 2 and 3.

3.13.1 Land Uses, Pricing & Regulation Though there has been a return to absolute population growth in the larger cities, the Scenario 1 assumption of greater dispersal of population out from cities has been dominant since 2000 – not only to settlements 20 kilometres from city centres but over longer commuting distances (since most employment growth has been in cities or in the 'working from home' category). Lower house prices further out from cities have outweighed higher commuting costs though, in new and expanded settlements, cars are used for a wider range of travel than in the case of city dwellers. Scenario 1 has also been reflected in that, though assuming more radical changes in transport pricing (including charging for parking), it incorporated a slower pace of change than the other Scenarios.

3.13.2 Infrastructure Provision Scenario 1 had the highest level of road investment and the lowest levels of investment in rail, buses, walking & cycling. Major road schemes in this scenario completed by 2015 include:-

- completion of 3 lane motorway from south Lanarkshire to the Border and on to Carlisle
- new motorway approach from M9 to Forth Road Bridge and additional Kincardine Bridge
- 3 lane urban M74 in Glasgow
- completion of mainly 2 lane M80 from north of Stepps to Haggs
- extension of M77 from Malletsheugh to Kilmarnock and related link to East Kilbride
- A78 Ardrossan-Saltcoats-Stevenston bypass
- completion of upgrade of Fort William-Mallaig A830

In addition, there have been various rural trunk road schemes plus commitments to:-

- completion of additional Forth Road Bridge by 2016
- completion of parts of Aberdeen Western Peripheral Road by 2017 and full route by 2019
- completion of Baillieston-Newhouse section of M8 and related M73/M74 improvements
- full dualling of Perth-Inverness A9 by 2025
- dualling of A96 from Inverness to east of Nairn as part of dualling of entire route

3.14 Rail schemes in Scenario 1 included:-

- interchange improvements and extra platform capacity in Glasgow and Edinburgh
- track upgrading on WCML and ECML plus electrification from Edinburgh to Glasgow Central and a spur to Glasgow Airport
- reopening and electrification of Hamilton-Larkhall
- suburban service improvements (possible joint running with Light Rail)
- Glasgow Crossrail (Shields Rd to Bellgrove)
- Stirling-Alloa and Thornton-Leven reopening

Since 2000, it has become apparent that interchange improvements in Glasgow and Edinburgh will not be fully completed until 2019. Completion of Edinburgh-Falkirk-Glasgow Queen St electrification has been delayed until 2017 though with the lines via Shotts and to Dunblane and Alloa also electrified by 2019. This may include the Glasgow Crossrail link. The Stirling-Alloa line has already reopened with usage above forecasts. The Glasgow Airport rail link was deleted from government programmes to 2015 but may be revised. A direct rail link through Edinburgh Airport was also deleted with priority given to an airport tram link.

3.15 Additional rail changes have included:-

- electrification of the Edinburgh-Bathgate line and a reopened electrified link through to Airdrie joining the existing electrified route to Glasgow
- electrification of the lines from Glasgow to Paisley Canal and Whifflet and from both Glasgow and Motherwell through to Cumbernauld
- improvements in service frequencies and expansion of Sunday services
- provision of third track between Glasgow Shields Rd and Paisley Arkleston plus other work on track doubling, signalling, platform lengthening and provision of additional passing loops
- a small number of additional stations on existing route opened between 2000 and 2014 *(Beauly, Conon Bridge, Laurencekirk, Dunfermline Queen Margaret, Edinburgh Park, Gartcosh, Kelvindale & Howwood) (Alloa, Brunstane, Newcraighall, Chatelherault, Merryton, Larkhall, Caldercruix, Blackridge & Armadale also opened on passenger route extensions)*
- completion of reopening of the Edinburgh-Tweedbank Central Borders route by 2015
- controversial approval of a shortened EdinburghAirport tram route which opened in 2014 and is likely to be further extended to Leith (as originally planned) by 2020

3.16 Scenario 1 also included some selective work on bus priorities and busways. Apart from Edinburgh, some busgates in Glasgow and the planned City Centre - South Glasgow University Hospital Bus Fastlink (due to open in May 2015), actual progress has been below the expectations in Scenario 1 and far below the urban transit, walking and cycling expectations in Scenarios 2 & 3.

4 ANALYSIS

4.1 Comparing the 2000-2020 scenario forecasts published in 1999 with actual outcomes for 2000-15, the main feature to be explained is why actual total movement barely changed between 2000 and 2015, reflecting Scenario 3, yet with the degree of modal shift to public transport and active travel being lower than expected in Scenario 3. This position is unlikely to be substantially changed in the remaining years to 2020 but convincing explanations of the departure from previous trends are required – not least because these are relevant in deciding what patterns of investment, pricing and regulation may best fit with future preferences and available funding.

Table 5 Estimates of Growth in Movement and Mode Share within Scotland

	Scenario 1	Actual	Scenario 3
1999 Estimates for 2000-2020	+41%		zero
Assessment of actual growth 2000-2015		+7.7%	
Actual growth per head of population		+2%	

	Modal share	**1999 estimates**		**2015 estimates of modal share**		
	2000	2020	2020	2015	!	*2020*
	ACTUAL	**Scenario 1**	**Scenario 3**	**Probable**	**!**	**Expected**
Walk/cycle	3.9%	3.2%	8.0%	5.6%	!	*6%*
Car driver	48.3%	48.2%	33.3%	49.3%	!	*45%*
passenger	30.7%	30.6%	24.5%	24.2%	!	*26%*
Bus/taxi/DRT	9.3%	8.3%	15.7%	11.4%	!	*12%*
Rail	3.8%	6.3%	15.4%	5.6%	!	*7%*
Other	4.0%	3.4%	3.1%	3.9%	!	4%
Modal share in Compact Urban Zones *						
Walk/cycle		9.5%	20.7%	12%	!	14%
Public transport/DRT/taxi		16.2%	34.8%	22%	!	26%

* Based on areas within12 kilometres of city centres – with public transport share higher at peak periods

Explanations of why Growth in Total Movement within Scotland has slowed

Forecasting Models

4.2 The forecasting models in use around 2000 still indicated significant, though somewhat lower, growth in total road traffic in Scotland with the car increasing mode share, bus use in substantial decline and rail use falling slightly. This was included in the forecasts presented to the Central Scotland Transport Corridor Study conducted in 2000/2001. This study also examined potential land use changes and the capacity of existing road systems in Scotland's most populated zone. It favoured a spread of population out from Edinburgh and Glasgow though with employment remaining more concentrated. This led to a strategic decision to endorse the electrification of the Edinburgh-Bathgate line through to Airdrie to connect with the existing electrified route through Glasgow in association with major new housing on this corridor. Completion of the M8 was also endorsed though with plans to make this a 3 lane motorway throughout shelved.

4.3 On this corridor a significant shift from car to rail commuting was anticipated and accompanied by the opening of Edinburgh Park as a new station serving the west Edinburgh employment zone. The Edinburgh-Bathgate line, reopened in 1986, had already shown an encouraging growth in usage. However, plans to electrify the principal Edinburgh-Glasgow route via Falkirk and the supplementary route via Shotts were deferred, partly due to the longer route from Glasgow Central to Edinburgh via Carstairs already being electrified.

4.4 The DfT Review in 2014 of the Transport Model for England concluded that car driver and light van trips could still rise on strategic roads by between 27% and 57% between 2010 and 2040 though growth could be lower on local roads and in larger cities. The Model shows a further fall in car occupancy and also in trips by foot, cycle and bus though with rail passengers having only a marginal fall. With an assumed 18% rise in English population, the model accepts that annual growth in passenger movement per head could fall below 1% between 2010 and 2040 but has been criticised for ignoring the evidence of stabilised movement and modal shift from cars in the National Travel Survey *(Local Transport Today 661 28 Nov. & 662 18 Dec., 2014; Prof. David Metz 'Peak Car – The Future of Travel', Landor Links, 2014).*

4.5 There has been a growing disconnect between relatively expensive and lengthy modelling procedures and examination of what has actually been happening, and likely to continue, in the real world. Apart from the impact of rising population, models now recognise a slowing in the rate of growth in movement within Britain. Yet modelling forecasts have lagged actual change. Forecasts include low, high and median growth but, in practice, revised estimates of 'low' growth have turned out to be the new 'highs'. In larger cities, and especially in London, growth in public transport, cycling and walking has been strongly positive since 2000 along with evidence of absolute cuts in inner city car use.

4.6 There has been growing interest in a change from detailed road vehicular traffic national modelling to an examination of 'Scenario' approaches to forecasting and appraisal, including a review of the valuation of time savings relative to other factors in cost benefit assessments. In producing the latest modelled forecasts, DfT has stated that *'they should not be viewed as what we think will actually happen in the future or what we would want the future to look like'*. Given this admission, it is surprising how much attention is still being given to road vehicular modelling compared to scenarios looking at total movement and modal share.

4.7 There is little doubt that the level of movement per head of population in Britain has come close to stability or moderate decline. Indeed, as far back as 2002, the Scottish Government's 'Transport Vision', issued just before the sudden resignation of Wendy Alexander as Transport and

Enterprise Minister, stated the aspiration to stabilise total movement by road vehicles at 2001 levels by 2021 *(Scottish Transport Review Issue 17 Spring 2002).* Apart from the impact of a return to population growth in Scotland, the data suggests that this has been happening. One contrary trend, apparent in Table 5, is that road vehicle kilometres by car have actually risen slightly due to a fall in car occupancy levels, often most apparent at peaks and aggravating congestion and unreliability on commuting routes already nearing capacity. If occupancy levels had stayed stable, or increased, car vehicle kilometres would have shown a fall, rather than a slight rise, between 2000 and 2015 even after allowing for some increase in population.

4.8 In explaining this stability in movement, two main factors have been at work. These are the
a) the 'inevitability' of a declining rate of growth in road vehicle kilometres and
b) the impact of major recession since 2008

The 'inevitability' argument relates to public and business reactions to technical innovations and changes in consumer preferences. Motorised road travel (including the period of huge expansion in electric road trams from the later 1890s to the early 1920s) was the dominant transport innovation of the 20th century and very much in tune with a public desire for increased mobility further aided by rising real incomes. Initially, this meant a rapid transition to buses, vans and lorries but increasingly to cars from the 1960s. Rail modal share of both passenger and goods movement saw continuing decline though more intense for goods movement than for passengers.

'Inevitability'

4.9 With high levels of car ownership and HGV operation by the 1980s and innovations such as mass air travel and the revolution in electronic communications, there was also a large fall in rates of growth in road vehicle kilometres and also evidence of revival in rail use and in both city bus use and longer-distance coach travel. This had cumulative impacts reducing the rate of growth in road vehicle movement. Due to the rise of mass air travel in the USA, car modal share there has been falling since the 1960s but, in a much smaller Britain, air travel had a limited impact on domestic movement apart from some longer flows between Scotland and England. The preference for increased physical movement (unlike rising demand for electronic communication) in Britain was weakening from the 1980s despite a continuing rise in real incomes. This rise in incomes did promote a marked rise in 2 car+ households with the side effect that a continuing, though slowing, rise in the car numbers meant that they were used less – occupancy levels fell.

Recession

4.10 Recession since 2008 has clearly had an effect on slowing, and reversing, the rate of growth in movement in Scotland, England and Wales (see Tables 3 & 4). However, the trend to reduced growth in domestic movement per head was already well established before the recession and there are few indications of a return to previous levels of growth. This is not to say that growth in total annual movement has stopped. National data is misleading in omitting movement outside Britain, both by British residents and by visitors from overseas. As Table 6 shows, the former high rise in air travel was reversed from 2008 with total passengers in 2012 over 2m less than in 2008 but with almost the entire fall concentrated on domestic UK traffic

Table 6 Passengers to and from Principal Scottish Airports
(millions exclusive of a low level of internal air travel and oilfield traffic)

	2002	**2008**	**2012**	
UK domestic traffic	11.45	11.93	9.88	*Source: Scottish Transport Statistics*
International traffic	6.49	10.33	10.18	*No 32 2013 edition*
TOTAL	**17.94**	**22.26**	**20.06**	*Tables 8.2 & 8.3*

4.11 UK domestic traffic includes passengers changing at hub airports in England for international flights. The proportion of such interchanges has been falling due to increases in direct flights to and from Scotland and flights to and from international hubs in mainland Europe and the Persian Gulf. Data since 2012 suggests that passengers are likely to surpass 2008 levels in 2015 with most growth continuing to be on international routes, including a greater shift to long-haul routes. Prestwick has seen a substantial loss of passengers with the transfer of most flights to Edinburgh and Glasgow Airports. Edinburgh is now the fifth most used airport in the UK, coming after London Heathrow, Gatwick, Stansted and Manchester. These statistics suggest that the recession has had a pronounced short-term impact on overseas air travel but with growth resuming, possibly at a lower rate, as real incomes improve at home and abroad.

4.12 Apart from some references to freight and limited upgrades of the existing Anglo-Scottish East Coast and West Coast rail routes, the 1999 Report did not deal with changing flows to and from Scotland. Since then, development of an HSR (High Speed Rail) network within Britain and the future level of air travel have become major issues affecting transport policy, connectivity and reductions in greenhouse gas emissions. These issues require more attention.

4.13 Reverting to movement levels in Britain, it is arguable that the nature of the recession may have intensified a shift from car use to public transport and active travel since it led to a greater rise in the total costs of car use, and petrol in particular, compared to the costs and benefits of walking, cycling and public transport use. Yet the trend away from car use was already evident before the recession despite low or no charges for parking at many locations and major road investment encouraging car use. Much less attention was given to investment, fares and traffic management measures encouraging both public transport use and shifts to walking and cycling. This suggests that the main origins of shifts in modal share away from car use lie in fuller examination of the arguments for an 'inevitable' fall in car modal share.

Explanations of Shifts in Modal Share

4.14 Table 5 shows that car use fell from 79% of total movement in Scotland in 2000 to 73.5% in 2015 and a potential 71% in 2020 (influenced by policies and pricing actually prevailing between 2015 and 2020). This compares with the original Scenario 1 showing a stabilised 79% car share of movement between 2000 and 2020, contrasting with the Scenario 3 indication of a car modal share down to 58% by 2020. The questions arising are *'Why has car modal share begun to fall*?', *'Why has the fall in mode share been less than expected in Scenario 3?*' and '*Is it desirable or detrimental to have a fall to a 58% share by 2040 or earlier?'*

Why has car modal share begun to fall?

4.15 At least eight factors (often inter-related) appear to have affected the fall in car modal share between 2000 and 2015. These are:-

1) a fall in usage per car as car ownership nears saturation point and contributes to falls in average car occupancy rates *(with little evidence that any net impact of technical change will boost car use per head of population - the opposite trend is more likely, including falls in car ownership but an appreciable rise in shared car use aided by technology and changing taste)*
2) a rise in the use of alternatives to cars by visitors to Scotland in association with a rise in the number of Scottish residents travelling overseas (and so using cars less within Scotland)
3) the impact of changes in the cost and convenience of car use relative to alternatives
4) the impact of technical and legal changes making it easier to use w-fi and electronic equipment while on public transport rather than as a car driver
5) demographic change with a growing 'younger' cohort less attached to car use and an ageing population inclined to travel less and to use public transport (including DRT) rather than cars

6) substitution of longer trips to work and for shopping/entertainment with increased working from home, greater use of local outlets (with some accessed on foot or by cycle) and on-line access for shopping, entertainment and contacting friends and relatives
7) a shift among car owners towards shorter trips using formal and informal arrangements for park and ride rather than longer car trips *(reinforced in part by greater efforts to ensure that major events – such as the Glasgow Commonwealth Games and the Gleneagles Ryder Cup - had higher proportions of access by public transport. Since reopening in 1979, the SECC station in Glasgow has risen to be the 13th busiest station Scotland with over 1.3 million passengers a year)*
8) other changes in consumer attitudes and spending making it more likely that a greater proportion of personal and business spending will be diverted from car use to both non-transport purposes and to public transport (which also involves walking or cycling) and to additional more localised walking and cycling trips involving lower costs but also seen as benefiting health

4.16 It is difficult to determine a weighting for each of these factors but (8) may have the greatest influence. In a November 2014 feature in the Herald Colin McLean, MD of SVM Asset Management made the significant comment that *'the way people live, work and travel is changing - - car manufacturers could see much-diminished demand in the longer term. The younger generation view a car as an expensive asset sitting idle much of the time, and are less attached to prestige. New services to meet their demand have emerged; many of these related to internet-enabled taxi and shared-use models such as Uber and Zipcar'*

Why has the fall in car modal share been less than expected in Scenario 3?

4.17 As Table 5 shows, the fall in car modal share to 2015 has been almost entirely due to the fall in car occupancy rates and a rise in the modal share of rail, buses, DRT and walking/cycling. This means that the fall in distances travelled by car has actually involved a small rise in car kilometres – due to a rise in distances driven with only the driver as an occupant. Car use was also encouraged by land use policies favouring dispersal of housing and the provision of major new roads or road widening without additional user charges or other measures to reduce congestion. This extra road capacity, be releasing 'repressed demand', could then promote increased usage and a return to congestion, as argued by the opponents of major road schemes. Given these views, , it is surprising that many major new road schemes in recent years have not produced higher vehicular traffic levels.

4.18 Table 3 indicates that several major road schemes – and notably the 3 lane extension of the M74 to the Scottish border- have not led to increased vehicle volumes. Instead, there have been rises in rail and coach use on these corridors. This poses important issues relating to the value and phasing of such road investment. Nevertheless, such schemes and the lack of differential road charging (despite this being applied on the rail network) must have contributed to a smaller fall in car modal share than might otherwise have occurred.

4.19 Changing personal preferences, rather than changes influenced by government policy, appear to have been the main influences on the rise in rail and bus use and in walking and cycling. The business decisions made by Network Rail, rail passenger and freight operators and bus operators seem to have played a larger role than explicit government policies in encouraging more overall use of rail and bus services though still lacking a framework for greater co-ordination of fares and services and increased synergy with land use, interchange and bus priority programmes.

4.20 Both before and since 2000, politicians have tended to support major infrastructure projects and free bus travel across Scotland for the elderly and disabled rather than packages of smaller and well-timed measures which could have accelerated delivery of the policy aim of increased

shifts to public transport and active travel, especially in and between Scotland's cities and larger towns but also recognising the potential for more sustainable tourism.

4.21 Given the growing, and continuing, restraints on public spending since 2000, actual decisions on spending priorities have hampered a greater degree of modal shift despite this offering considerable economic and social gains. Three examples illustrate this point.

Example 1 Cross-party (apart from the Greens) approval for an extra Queensferry Forth crossing financed by cutbacks in other areas of government spend and with former income from tolls to come from other sources or met by further cuts in spending

This decision has slowed action on other more cost-effective packages, including improved road and pavement maintenance, traffic management packages aiding bus movement and faster action on cutting costs related to rail infrastructure and signalling while raising service quality, capacity and rolling stock availability. For at least the next 10 years, the existing road bridge at Queensferry has been found to be in no danger of serious deterioration and capable of handling more passengers through increases in both rail and bus use and in car occupancy levels at peaks

Example 2 Cross party support (at considerable cost in compensation to operators) of free bus travel throughout Scotland for those over 60 or disabled

This decision must have required a further rise in rail passenger support to deliver the service levels desired by the Scottish Government while using scarce funds in a manner offering low economic and social benefits. Better outcomes would have been likely if spending priorities had been changed to provide free or low flat-fare travel by all local public transport for those over state pension age or with other problems in securing access to employment, training and other facilities. Free bus travel is of little benefit if no suitable local bus is available and the network suffering from further cuts

Example 3 Edinburgh Tram and Borders Rail projects

Though these schemes have had priority, procurement has been costly and lengthy with neglected opportunities for cost control and greater synergy between rail and tram investment. There has also been a lack of full co-ordination between rail, tram, bus, parking and land use policies encouraging greater reductions in car use in and around Edinburgh

4.22 Giving the short time between 2015 and 2020 and the time and skills required for developing packages to encourage modal shift, only modest further progress is likely by 2020. Table 5 suggests that a realistic target for 2020 would be to maintain stability in total movement per head but ensure a further fall in car modal share from 73.5% in 2015 to 71% by 2020 *(69% was the 2020 expectation in the 1999 Scenario 2 assessment unlike the 58% car share expected in Scenario 3).* There is a risk that a continued sharp fall in petrol prices, in the absence of higher motor taxation or differential charges, could prejudice further shifts to public transport and active travel.

4.23 However, rises in the use of public transport in and around cities seem to have been influenced more by the level and structure of parking charges, and by improved frequencies, capacity and reliability on key urban transit corridors than by the impact of higher petrol prices. Falling petrol prices may have a lesser impact than expected in slowing the rate of decline in urban and inter-urban car use per head of population with a related slowing of emission reduction.

Is it Desirable or Detrimental to have a further reduction of car modal share to 58% by 2040 or earlier?

4.24 The principal focus in the 1999 Report was on assessing Scenarios in relation to their impact on cutting greenhouse emissions from movement within Scotland by around 35% by 2020 though such a cut was also found to offer other economic and social benefits. These included a more robust and fairer economy with improved local environments, health and well-being together with a realistic contribution to worldwide efforts to avoid adverse impacts from major climatic change.

4.25 Since 1999 many politicians have become more concerned with countering the adverse impacts of post 2007 recession and higher rates of population growth. Despite some continuing efforts in Scotland and in other countries, there has been less interest in cuts in greenhouse gases. It was only in 2014 that adverse weather and renewed scientific evidence has seen some revival of UK and worldwide interest in greenhouse gas reduction and potential international action.

4.26 But there are still substantial sections of opinion which see greater and earlier economic gains from slowing action to reduce dependency on fossil fuels and accelerating falls in the cost of such fuels, at least in the short-term. Those supporting higher rates of net reduction in fossil fuel use are also divided on the emphasis to be given to energy conservation and to the degree of shift to nuclear power and renewable energy sources.

4.27 There has also been a recent growth of interest in energy intensive **'connectivity'** as a means of raising productivity and global competitiveness. Yet at the same time, there has been fresh thinking on changes in actual relationships between transport, the economy and society. Views also differ on whether population growth is good or bad for the economy and society.

4.28 Though predicting the future is always difficult, examining actual outcomes since the publication of the original 2000-2020 Scenarios is useful in considering the costs, benefits and public acceptability of ongoing Scenarios.

4.29 The key outcome from the 2000-2015 evidence is that movement per head of population in Scotland has stabilised as predicted in Scenario 3 but that there has been a less pronounced modal shift to public transport, walking and transport due to relative failure to deliver the action required to increase incentives for shifts away from car use. Political actions have actually been closer to Scenario 1 yet this did not produce the level of extra movement associated with Scenario 1. Stabilised movement appears to have come about mainly due to changes in consumer preferences and spending rather than political action.

4.30 The failure to ensure a higher level of modal shift has meant that savings in greenhouse gas emissions from movement within Scotland are likely to be around 15% by 2020 rather than the 40% aim of Scenario 3. However, despite a fall in car occupancy, a greater proportion of savings have come from changes in driver behaviour and the type of vehicle used rather than from shifts to public transport, walking and cycling. Influenced by a lower population density and franchise specifications, passenger train occupancy has been lower than in England. This raises energy use per passenger kilometre but keeps it lower than in single occupant cars.

4.31 Well-loaded buses are also considerably more fuel efficient than cars. Rail, unlike movement by car and bus, is becoming more reliant on fuel from non-fossil sources. Energy efficiency is being improved both by higher train load factors and by greater reliance on non-fossil electricity as

a power source. In contrast, the 'electrification' of road transport (and of air travel and shipping) remains much more difficult to deliver. Due to the recent fall in oil prices, it is even more important that transport and energy scenarios take account of the need for further cuts in greenhouse gases. A reasonable assumption would be to seek further cuts of at least 25% in emissions from internal Scottish movement by 2030 with continuing pressure towards a low carbon economy and low carbon transport by 2050.

4.32 A downside of the 1999 Report was that it did not consider the implications of continued growth in movement to and from Scotland, especially with respect to the dominant role of aviation but also in respect of shipping – with both of these sectors still heavily dependent on fossil fuels. This needs more consideration in Scenarios to 2030 and may require greater cuts in fossil fuel emissions from land transport if overall targets for a **near elimination of net greenhouse gas emissions** are to be met by mid-century. Preferred Scenarios also require greater emphasis on improved **urban air quality and city centre ambience**. Important new issues in the evaluation of Scenarios are emerging, including divergent views on the impact of improved 'connectivity' in raising levels of economic growth and well-being per head of population.

4.33 **'Connectivity'** has moved up the political agenda since 2010 with an emphasis on major projects transforming trip times between cities and also within cities. In Britain, this started with the HSR phased plans for HS2 providing a new route north from London as far as Manchester and Leeds by the early 2030s and the autumn 2014 proposal for an HS3 route across the Pennines between Manchester and Leeds. Other cities, including Glasgow and Edinburgh, have joined campaigns to be placed directly on the HSR network. HSR has been advocated as a means of avoiding additional and/or widened motorways and encouraging a shift of economic activity away from an overheating London to alternative locations, especially in the English Midlands and North.

4.34 Sub-issues have arisen regarding the scale and location of enlarged major stations or new hubs linking well with improved city transit. Shorter city centre to city centre times are seen as being of little value unless linked with high frequency and reliable city transit, including better public transport access to major airports. Yet the high capital costs of such schemes and their local environmental impact have attracted criticism and suggestions that alternative packages for capital spending and traffic management could offer better value for the economy and well-being. Without careful consideration, HSR could lead to greater growth of movement within Britain. While allowing a substantial further cut in Anglo-Scottish air travel, this could have the downsides of releasing more slots for international travel (and the use of larger aircraft) to and from London and a further rise in long-distance commuting to London and into other larger cities.

4.35 There is an unresolved conflict between the conclusions of the **Airports Commission** (and of some business opinion in Scotland) that the South-East requires an additional runway to increase benefits to the entire economy while the UK Government is arguing that an HSR network and improved city transit outside London is needed to optimise economic gains.

4.36 The hype attached to HSR, despite a lengthy period for construction, has obscured both the importance of pragmatic Scenarios for the 2020s and the role of other factors influencing productivity, competitiveness and the potential gains from a reducing London and South-east share in the British economy. By far the largest expansion in 'connectivity' has been in international air travel and use of the worldwide web rather than greater physical movement in the UK.

4.37 Consultancy Frost & Sullivan sees opportunities for as many as 7m people living in a flourishing and high quality Scottish Central Belt environment by the later 2020s – a far higher percentage growth than is likely around London. 7m seems an excessive estimate for the Central Belt but other parts of Scotland have opportunities for population growth without the problems arising from expansion in the London area and Scottish population growth only in the Central Belt.

4.38 These opportunities are unlikely to require a rise in present investment in vehicles and in transport infrastructure. A rise in population will lead to some growth in movement but at a rate below, rather than above, population growth. This will be mainly due to shifts in consumer preferences but also encouraged by Scottish Government and local authority action programmes giving further impetus to shifts to public transport, shared car use (rather than ownership), walking and cycling. However, overseas air travel (including an expansion of in-tourism) is likely to grow by more than the rate of population growth but to a lesser extent than in current aviation forecasts.

4.39 With respect to HSR, more emphasis is being put on new route allowing maximum speeds of 300/360kmph on key corridors with major capacity problems in handling rising volumes of long-distance passengers, intra-regional passengers and freight plus lesser improvements on other sections of existing route allowing speeds up to 200/240kmph and more opportunities for express inter-city services to overtake freight and stopping passenger trains. There is a clear intention that HSR trains should operate over sections of existing route pending decisions on extensions of new route. HSR services will operate over long sections of existing route north of Crewe but with improvements allowing 3 hour trip times between both Glasgow and Edinburgh and London by 2030 plus associated cuts in trip times between Scotland, Manchester and Birmingham. HSR construction will be additional to increased investment already announced for rail infrastructure improvement and extended electrification on the existing rail network.

5 Revised Scenarios 2020-2030

5.1 Scottish Scenarios for 2020-30 should be evaluated as a top Scottish Government priority with the aim of adoption of a Preferred Scenario and related Action Programme in 2016. This Programme should then be revised, and taken forward, at five year intervals. It should also include involvement of the UK government with respect to Anglo-Scottish movement and the impact of Scenarios on ports and airports.

5.2 Rather than being seen as the leading aim of such Programmes, cumulative cuts in greenhouse gas emissions should be regarded as a valuable added benefit to be further encouraged but in line with changes in the consumer preferences of individuals, business and government themselves contributing to greenhouse gas reduction and to improved air quality in city centres and close to major road interchanges. A greater influence on Scenario assessment will be emerging views on future relationships between transport, the economy and well-being. Scenarios require stronger inputs on pricing, government policy options and greater reliance on evidence relating to personal, business and tourist preference and spending patterns. Scenarios presently in use continue to have an excessive reliance on differing assumptions relating to population levels and real incomes rather than on policy changes aligned with differing perceptions of desired changes in the economy and society.

5.3 As in the 1999 Report, Scenarios should be refined to not more than three. Their precise content requires further consideration but possible options could be:-

a) Continuation of a **'Predict and Provide'** approach assuming that the economy will have the greatest gains from a mix of public and private investment in transport infrastructure

b) a **'Decide and Provide'** approach with a downgrading of the importance of major public and private investments in transport and increased attention to the economic and well-being advantages of a relative transfer of spending from transport to other sectors

c) a **Market-oriented Approach** relying on electronic means of direct payments for transport related to changing personal, business and tourist preferences but also taking account of equity, welfare and regional devolution issues

5.4 'Predict and Provide', together with high values for notional time-savings, remains the DfT's preferred approach in England and is echoed by the Scottish Government. It admits that there are research gaps in finding explanations for the recent stabilisation of movement per head within Britain (also found in other countries) but takes the view that the end of recession and a rise in population and real incomes will lead to average future annual growth in road vehicle kilometres around 2% (calculated before the fall in oil prices) with the recent rise in rail passenger use falling below 2%. Public transport predictions are of rural falls, some growth in larger towns and only modest rises on inter-regional rail (LTT662 & 663 9 & 23 Jan 2015; Modern Railways Feb 2015 p37-39)

5.5 'Decide and Provide' has been advocated by Prof Glen Lyons (LTT 9 Jan 2015). He emphasises the importance of political decisions on what we want the future to be and is highly critical of predictions of population and real income growth leading to any return to significant rises in car use. He also seeks clearer thinking on actual relationships between high investment in road schemes and special economic benefits for the economy and well-being.

5.6 The main advocates of the 'Market Approach' have been Derek Halden in his 2014 STSG paper on *'Paying for Better Transport'* and Debbie Wosskow on *'Unlocking the Shared Economy'* (LTT663 9 Jan2015*)* Derek comments on the lack of a normal 'market' for road use but also on the opportunities in an electronic age to introduce greater choice for both car users and public transport users in ways which could improve funding prospects for a transport sector otherwise threatened by large cuts in public spending. Cuts in demand for individual car ownership could also allow personal spending to be diverted to other priorities, including better and more equitable access to facilities with less centralised decision-taking.

5.7 Of these three Scenarios, 'Predict and Provide' (though now being qualified in ways taking it closer to the other Scenarios) seems the least justified as being contrary to recent, and continuing, structural changes towards less movement per head and greater shifts to emission reduction and to public transport and active travel over the period to 2030. Lower levels of car use, less intensive road freight and problems in securing rapid 'electrification' of the road sector are casting doubt on the effectiveness of many major road schemes in making a positive contribution to economic development and to a shift in the balance of economic activity away from London and the South-east. A similar, but less intense, critique can be made of the ability of major High Speed Rail schemes on their own to influence the balance between British regions. Contrary to the present 'Predict and Provide' National Model, road traffic seems more likely to remain stable even if there is growth in population and in real incomes. However, if there is higher real income growth for reasons unconnected to transport, it may be that such prior growth could assist the funding of more ambitious, yet selective, rail and road infrastructure investments.

5.8 The 'Decide and Provide' and 'Market' Scenarios are closer than might appear at first glance. The former suggests centralised decision-taking while the latter, though involving political initiatives to change the transport framework, favours a much greater role for individual and business decisions facilitated by developing electronic technology. Under both 'Decide and Provide' and the 'Market' approach, many

decisions would become more decentralised - creating new structures for funding, rather than the present reliance on national taxation and related borrowing with scant attention to the high level of 'private' transport spending on vehicle purchase, maintenance and electronic aids for transport and access.

5.9 In Scotland and over Britain as a whole, the Scenario most worthy of further examination in likely to be an amalgam of the 'Decide and Provide' and 'Market' approaches with a strong element of devolved decision-taking in both urban and rural regions but retaining a significant role for the UK government in assessing, and contributing some funding and fiscal/regulatory support for changes in the regional balance of economic activity.

5.10 A further factor influencing the future is the growing stress on assessment of 'well-being' and 'equity' rather than a heavy reliance on present statistics on real income and income per head. In practice as well as in theory, improvements in 'real' income can exist alongside evidence of a deteriorating sense of 'well-being'. This needs greater attention in future transport and access scenarios.

5.11 A final issue to be incorporated in Scenarios is the extent to which technology may be able to ensure large cuts in emissions without much change in levels of movement and modal share. The actual use of new technology is more likely to be influenced by relative changes in costs, consumer preferences and political priorities influencing greater changes in movement and modal share.

5.12 Looking beyond 2020, the main choices for further speculation, research and decision-taking lie between a slightly modified 'Predict and Provide' Scenario reliant on traditional modelling OR a 'Market' Scenario within a substantially changed political framework . National modelling would be replaced by separate scenarios for movement and modal share at regional and inter-regional level more influenced by consumer and community preferences, key political priorities and a better understanding of future relationships between transport, the economy, well-being and lowered carbon.

5.13 The main problem with even a modified 'Predict and Provide' Scenario is that it contains an assumption that more connectivity and physical movement, especially in space consuming and under-occupied cars idle for most of the day, is good for the economy and well-being. In reality, improvements in connectivity are now provided through the internet, international air travel and the provision of less space and energy intensive public transit and some rise in car occupancy rates. Personal preferences are also shifting to less and, in some cases, slower travel with rises in working from home, shorter commuting trips and greater reliance on public transport and on walking and cycling both as a means of access and for leisure and personal health benefits. Apart from some carefully selected schemes, higher investment in transport infrastructure has become less relevant for a successful economy and enhanced well-being. At the same time, there are indications - especially in cities - that more people are becoming less interested in investing in either single or multiple household cars, preferring instead to rely more on public transport, walking, cycling and occasional car hire or the use of car clubs.

5.14 Continuation of the 'Predict and Provide' approach carries the risk of an over-provision of road capacity when demand for car use is falling or being mistakenly slowed by government allowing a large fall in petrol prices. Present modelled predictions, after allowing for population growth, now expect a resumed growth in total movement around 2% a year with the public transport and active travel share of movement falling rather than rising. This contrasts with actual evidence of almost stable road vehicle kilometres per head since 2000, record levels of rail passenger growth, notably in and around cities, and a reversal of previous falls in bus use though with variability in the performance of different towns and cities. The present 'Predict and Provide' approach seems to over-estimate the case for an enhanced road network and under-estimate the merits of enhanced measures for road demand management and increased investment and revised pricing on public transport networks and parallel action to encourage walking and cycling. Such action could deliver greater overall gains for the economy, well-being and emission reduction.

5.15 These defects in 'Predict and Provide' strengthen the case for a 'Market' Scenario in a changed political framework for transport involving greater devolved responsibility for regional transport, economic development and well-being and separate, but linked, estimates of future changes in inter-regional and international flows. Dependent on further evaluations, it is probable that both the economy and well-being can gain from more intensive assessment, and application, of a 'Market' Scenario which in many respects is similar to Scenario 3 in the 1999 Report on 2000-2020 options.

5.16 It is recommended that such initial evaluations should be completed by Autumn 2015 with revised Action Programmes for Scotland and its principal regions published by Autumn 2016 and subject to five-yearly major review in the light of emerging outcomes and changing circumstances. Contrasting with 'Predict and Provide', it is probable that 'Market' Scenario outcomes may indicate a growing economy with a continuing stability in total internal passenger movement unless population and average growth in real incomes over the 2020s rose by more than 10%.

5.17 Looking at international and inter-regional movement, growth in the former is expected to be higher primarily due to a continuing rise in tourism and leisure travel with Scotland having added benefits from rising in-tourism being greater than growth in out-tourism. Anglo-Scottish passenger movement per head is likely to stay close to present levels but with a substantial shift in share from domestic air and longer-distance car travel to rail – aided by the delivery by 2030 of 3 hour trip-times on the Central Belt to London corridor with proportionate cuts and improved frequency for travel between Scotland, principal English cities and Cardiff. A similar, though less intense, change away from longer-distance car travel in Scotland is expected, and desirable. Travel to and from some regions will have a greater boost due to their heavier involvement in tourism and leisure activities.

5.18 Within the regions of Scotland, the majority of passenger movement – as now – will continue to be internal. Given further support for the continuation of recent trends, passenger movement internal to regions is likely to show the changes outlined below by 2030:-

a) stabilised overall movement with some regions showing decline due to falling population but others having growth related to population growth and higher economic activity
b) some regions seeing growth due to greater involvement in inwards tourism and leisure, including some shift towards walking, cycling and public transport
c) more populated regions, notably those around Glasgow, Edinburgh and Aberdeen, showing a fall in car ownership or long-term leasing and a greater shift to walking, cycling and public transport.

5.19 An area for further study is the extent to which daily access to a car may be replaced by expanded use of the shared car/car club sector or greater use of public transport incorporating a large expansion of DRT (including taxi use). Though an exceptional case, London is experiencing a fall in car ownership but high growth in public transport and cycling plus some growth in shared cars/car hire. Cars have fallen from 50% of trips in London in 1993 to 37% in 2013 and an expected 30% by 2050. '*Evidently, declining car use is not incompatible with a city that is thriving economically, culturally and* socially' (Prof David Metz in LTT 18 Dec 2014). The largest shift in London has been to rail use though bus use is also up. Smaller and more dispersed cities and towns are likely to experience lesser, but still significant, falls in car ownership and use but with some householders turning to car clubs as well as shifts to public transport and cycling.

5.20 Speculations on outcomes for internal movement and passenger modal share are included in Table 7 in APPENDIX 2. These suggest that the public transport/active travel share of Scottish internal movement could rise from 29% in 2020 to 37% by 2030 with the car share down from 71% to 63%. As at present, the public transport/active travel share would be higher in cities, especially at peak periods.

5.21 Similar assessments are required of future levels of **freight tonne kilometres and modal share** but are unlikely to influence overall conclusions since total internal vehicle and tonne kilometres seems set to contract given likely falls in the dense bulk movement of coal and oil and opportunities for better load factors. But there is a problem that loads are becoming bulkier yet lighter, requiring more lorry and container space. Some shifts from road to rail and water are expected.

6 RECOMMENDATIONS

1) The Scottish Government should check the 2000-2015 (Table2) assessments of actual change in movement and modal share for accuracy and publish results by autumn 2015

2) The Scottish Government should replace present approaches to movement and mode share modelling (still having a bias towards road vehicle modelling involving considerable time and costs in producing outcomes at variance with actual trends) with broader brush Scenarios better aligned with economic and social objectives and also involving a review of time-saving valuations relative to other benefits and transport's share of cuts in greenhouse gases

3) Multi-modal Scenarios should be developed for longer-distance movement and for movement in and around cities (to assist investment decisions on the balance of trunk road investment as against investment in city public transit and in inter-regional or tourist/leisure oriented public transport services)

4) The Scottish Government should publish revised 2016-30 Scenarios for movement and modal share for consultation in early 2016 followed by decisions on a preferred Scenario and Action Programme in autumn 2016 with provision for major reviews at 5 year intervals

5) Regional Transport Partnerships and Local Authorities should be encouraged to adopt parking, traffic management and land use policies ensuring greater shifts to public transport, shared-car use, walking and cycling

6) Motor fuel duties should rise by at least 5p per litre in 2015 subject to net proceeds being used to reduce fuel costs in remoter areas of Scotland and to increase the funding available to RTPs and local authorities to assist shifts to public transport and active travel. Duties should rise further if petrol/derv consumption falls by less than 1.5% a year but reduce if falls exceed 2%.

7) Strengthened regulation of local public transport (including DRT, taxis and local ferry/rail/tram services) should be introduced in ways reducing total costs but increasing benefits, including improved interchanges and wider use of smart multi-modal ticketing

8) Responsibility for Bus Service Operator Grant and compensation to operators for free (or low flat fare) concession travel should be transferred , along with related funding, to Regional Transport Partnerships subject to conditions that free (or low flat fare) travel was retained for travel by any local mode for those of state pension age or for such other groups as RTPs may decide with any balance of funding used to ensure more equitable access to facilities

9) Announcement of a study into longer-term funding and pricing arrangements for transport completed in phase with Recommendation 4 and considering opportunities for innovative funding, developer contributions and property levies

10) Retention of Air Passenger Duty (possibly at a lower rate for the next five years) at Glasgow and Edinburgh Airports plus requests to the UK Government to increase APD rates at Heathrow and Gatwick Airports with proceeds earmarked to aid faster progress on Anglo-Scottish HSR.

APPENDIX 1 Actual Change in Movement and Modal Share 2000-15 and 2020 Projection (explaining basis of Tables 2, 3 and 5)

Passenger kilometres by car are based on Scottish Transport Statistics (STS) for car vehicle kilometres and indications of average occupancy of 1.6 in 2000 and 1.5 in 2012 (STS No 32 2013 Table 11.2)

Scheduled bus and coach passenger kilometres are based on STS data on local bus trips and an assumed average trip length of 8km in 2000 and 12km in 2012 plus the added assumption (since STS contains no data on non-local scheduled bus trips) of 40m scheduled coach trips in 2000 with an average trip length of 40km and, in 2012, 50m trips with an average trip length of 50km. These assumptions are based on coach operator indications of strong growth in longer-distance coach trips (partly influenced by the introduction of free bus and coach travel throughout Scotland for concession holders). A statistical issue requiring further investigation is the extent to which movement by scheduled longer-distance coach may be included in estimates of 'local' bus trips

Passenger kilometres by taxis, Demand Responsive Transport and other private hire arrangements (including a significant proportion of travel to school) is an area of weak coverage and omissions in STS. However, though from a low base, there is evidence of strong growth in this sector. An assumption was made of a total number of trips in this category around 100m in 2000 with an average length of 8 km, rising to 120m in 2012 with an average length of 10km. A problem requiring further study is that part of the rise in car hire and car-sharing arrangements may already be reflected in STS data on car vehicle kilometres. Without separate checks by sampling (or use of GPS data), it is not easy to distinguish between car, taxis, light vans and cars being used as part of wider arrangements for car-sharing/car hire as distinct from informal arrangements for car sharing which are being encouraged by employers or other voluntary arrangements. Falling car occupancy suggests that it is not easy to make such arrangements yet new and more organised types of car sharing and the use of car hire to replace the purchase and related costs of a car have shown growth between 2000 and 2012 – with this growth likely to accelerate

The bulk of **rail passenger kilometre** information in Scotland is directly drawn from ScotRail data in STS but with additions to include Anglo-Scottish travel within Scotland and a further addition of 60m passenger kilometres in 2000 and 70m in 2012 for passenger miles on the Glasgow Subway, charter and heritage trains and the Cairngorm Mountain Railway. An allowance for Edinburgh trams is included for 2015. It has already been reported that Edinburgh tram use in 2014 has been above initial forecasts but with bus use in Edinburgh also still rising. Central Borders line rail usage is also included for 2015.

Kilometres travelled on foot is a topic area where STS is weak. In the past, numerous short trips have been excluded, as has walking away from public roads. Walking data has often been restricted to trips mad entirely on foot rather than in association with rail, bus and car trips. The Scottish Household Survey (as mentioned in Table 3) has shown that the share of household samples regularly walking has risen from 55% in 2000 to 66% by 2012 with walking to school falling more slowly from 55% to 51%. The volume of walking may have been under estimated due to the techniques used in 2000 but there is an impression of increased walking activity in Scotland both by residents and by tourists over the period to 2012.

The assumptions used in Table 2 were an average of 2000 walking trips per year by 4m people with an average distance of 0.25km in 2000 and a similar number of trips per day by 4m in 2015 with the same average trip length but an addition of 500m pass km for an overall rise in walking by an increased population and by visitors from outside Scotland. This estimate takes account of a likely shift in some trips from walking to cycling. Improved sampling of the extent of walking by residents and tourists is needed, especially in inner-cities and outdoor tourism areas.

Kilometres by pedal-cycle. Like walking, methods used in 2000 may have under-estimated cycling. Off-road mountain biking is not included but has seen substantial growth while Sustrans, SPOKES and other studies have shown large increases in commuting by cycle in both Edinburgh and Glasgow plus wider rises in cycling for other purposes including cycling for leisure. Some cycles now have battery assistance while there has been a noticeable rise in battery specialist vehicles used by people with disabilities in supermarkets and on pavements, roads and paths.

The assumptions made in Table 2 were of 0.5m people cycling at least once per week and averaging 700km a year in 2000 plus an added 150m passenger km for the remainder of the population and tourists with this rising to 0.8m of Scottish residents cycling an average of 1,000 km a year in 2015 plus an added 600m passenger km related to more in-tourists and increased activity by residents cycling less than once per week. As in the case of walking, improved sampling is needed to confirm actual changes in trends.

Other passenger movement. This was not examined in depth but assumes that the 'official' estimate of 'other movement' modal share within Scotland was unchanged between 2000 and 2015. Most of this movement is by ferry, a limited amount of internal movement by air and an allocation of external movement to and from Scotland by air and sea (e.g. ferry services to Northern Ireland) insofar as this was on, or above, the Scottish land mass and associated sea. There is also some personal movement by van.

Projections to 2020 The modal share projections from 2015 to 2020 are shown in Table 5. These suggest that it should be feasible to secure a further rise in modal share for rail, walking and cycling and corresponding falls in conventional movement by car. In the case of cars, car kilometres (mainly in congested area with rises in parking costs) would fall to a larger extent, due to a shift back to higher car occupancy. The bus/DRT sector (defined to include new forms of car/taxi hire and car-sharing) would also show some advance moderated by some mode shift to rail, trams, walking and cycling. In the longer-term, greater growth is expected in these newer aspects of DRT but there are limits to the amount of change which could be achieved as early as 2020

APPENDIX 2 Options for Transport Spending and Infrastructure Investment in evolving Programmes 2020 - 2030

The strategy outlined in the original 1999 Report placed the highest emphasis and priority on smaller packages of selective investment in association with pricing and management measures to increase the use of existing roads and railways unless – as in city centre and some other areas – there was a strong case for improving conditions for walking and cycling by reducing vehicular traffic volumes and speeds. The Report also identified some continuing examples of major road investments but favoured a greater shift in Scenario 3 to investment in inter-city rail (including electrification) and in City Metro , tram and core bus routes plus walk & cycle routes (post 1999 announcements of extra road and rail investments are listed at Paras. 3.13 to 3.16 of the present paper. These included reopening and electrification of Airdrie-Bathgate line and an additional Forth Road Bridge)

Most revenue spend had a focus on service improvement and fares reform with capital spend concentrated on public transport vehicle replacement, better quality, enlarged passenger capacity and relatively small network rail and bus network infrastructure improvements. Ten major rail network extensions were proposed in the 1999 Report but it was not intended that these, rather than lesser but cost-effective packages, would be the main means of promoting a rise in rail modal share – most of which has come through improved services and efficiency gains on the existing network. Major rail infrastructure investments, as well as major trunk road schemes, require review as part of reappraisal of which schemes make strong contributions to improvements in the economy and well-being. TABLE 7 speculates on how far a Market and Regionalised Scenario for Scottish internal movement might contribute to shifts in modal share within a continuing stabilisation of total passenger movement per head of population .

TABLE 7 Modal Share of Passenger Kilometres (on movement internal to Scotland)

	2020 (as in Table 5)		**2030**
Walk/cycle	6%		8%
Car Driver	45%	Continuous Car Access (Driver)	35%
		(Passenger)	18%
Passenger	26%	Car hire/car club (Driver)	5%
		(Passenger)	5%
(Car Total	*71%*		*63%)*
Bus/Taxi/DRT	12%	Scheduled Bus	10%
		Other bus and DRT	4%
Rail/light rail/tram	7%		11%
Other	4%		4%

The ten rail network extensions listed in the 1999 Report require reconsideration in the light of increasing restrictions on public spending and the advantages of smaller packages funded from reductions in the Trunk Road Programme – and also including transfers to improve local road and pavement maintenance plus other work to widen the availability of safer environments for walking and cycling. TABLE 8 reviews the position of the Top Five Major Rail Projects listed in the 1999 Report for completion by 2020.

TABLE 8 Top Five Major Rail Projects in 1999 Report : Comment and Outcomes

Scheme	**Outcome**
1 Glasgow Airport Rail Link	Cancelled but may be pursued in an amended form
2 Cross Glasgow Link (north-south)	Variants still under study. Likely to be influenced by outcome of Anglo-Scottish HSR studies. A rail route exists via the St Enoch Bridge but is not open for passengers
3 Stirling-Alloa-Longannet reopening	Completed for passenger use to Alloa and for freight on to Longannet coal-fired power station
4 Livingston (East Calder) to west Edinburgh and Edinburgh Airport and on to Fife and north using a new direct route from Ferrytoll to north-east of Cowdenbeath	Southern section affected by outcome of Anglo-Scottish HSR studies. Middle section uses existing Forth Rail Bridge Northern section included in previous Strategic Transport Review but not yet sanctioned
5 Edinburgh-Central Borders-Carlisle reopening	Section from Edinburgh to Tweedbank opens Sept., 2015

Revised Categories of Major Projects for evaluation in Scenarios 2020-2030

RAIL

1 Continued Rail Electrification Programme to 2030 including the route north to Aberdeen/Inverurie and south from Ayr to Girvan

2 Action to raise speed limits on critical sections of inter-regional route, relieving pinchpoints and including initial sections of High Speed Rail between Ferrytoll and Cowdenbeath and from Glasgow to the Carstairs area as part of plans for 3 hour trip times between Glasgow/Edinburgh and London by 2030

3 City Metro or Tram development (mainly on existing route but including an average of 8km a year of new route on protected formations) in and around Glasgow, Edinburgh, Aberdeen and on the Perth-Dundee-Arbroath and Dingwall-Inverness-Forres corridors.

4 Placing both Glasgow and Edinburgh Airports on the national rail network (in addition to existing plans for a rail station at Dalcross (Inverness Airport) on the Inverness-Elgin route)

5 Extension of Borders Rail to Newton St Boswells or Hawick plus other shorter extensions such as to Leven, St Andrews, Ellon and Banchory

MULTI-MODAL

1 Interchange Improvements in the major cities plus additional transport hubs at suitable locations with connecting buses and park-and-ride facilities, secure cycle parking and/or cycle hire facilities at suitable locations
2 Adjustment of budgets to take account of extra maintenance or route relocation costs to minimise adverse impacts from climate change

BUS

1 Development of high-frequency and more reliable city and town Bus Metro networks complementing City Rail Metro lines and with common branding and ticketing
2 New framework encouraging expansion of taxi and other demand responsive transport

ROADS, CYCLING & WALKING

1 **S**elective road dualling between Inverness and Perth and Inverness and Aberdeen but with provision, if population growth and road use growth is higher than recent trends, for an upgrade to motorway standard of the route north to Aberdeen, a 3-lane Edinburgh Bypass and EITHER conversion of all the central M8 to 3-lane OR provision of an alternative route linking Edinburgh and the Forth to south Livingston with a spur to south Lanarkshire joining the A74(M) at Abington. *(There has been speculation on technology making it feasible to consider not only greater use of automated trains within the rail sector but also the creation of automated roads. The capital costs of the latter could be high with only limited cuts in trip times compared to rail potential and future consumer preferences)*
2 No single major project but reallocation of budgets from major trunk road schemes to increase funding for local authority roads and both maintenance and enhancement of roads, pavements, local foot and cycle networks and public realm improvements

AIR

Provision of a second parallel runway at Edinburgh Airport post 2030 – though this has implications involving possible closure of Dundee and Prestwick Airports and a reduced role for Glasgow Airport

FERRIES

1 Works at Ardrossan and at Mallaig to improve reliability of ferry services, including increased frequency to Arran and a regular service to from Mallaig to South Uist/Barra
2 Provision of new Easter to October services interlinking Northern Ireland, Campbeltown and Port Ryan

Beyond 2030?

Other major infrastructure schemes have been suggested in recent years. On further examination, it may prove possible to advance some schemes to earlier years in the regular five-yearly major reviews of programmes. Such schemes have included:-

- full dualling of Newcastle-Edinburgh A1 and of the A9 & A96 between Perth and Inverness and Inverness and Aberdeen (presently in programmes for possible completion before 2030)
- tunnel or bridge links between and to Scottish islands (notably in Orkney)
- a direct rail line from Tain to Golspie, cutting times to the Far North
- a direct north-south, full gauge rail tunnel under central Glasgow with related stations
- electrification of the Perth-Inverness and Kilmarnock-Dumfries-Gretna rail lines
- a direct electrified rail route from Cowdenbeath to Perth
- an electrified route through Strathmore shortening passenger trip times to Aberdeen, enhancing rail freight potential and reducing capacity constraints through Dundee
- additional construction of Anglo-Scottish High Speed Rail within Scotland with related gains for rail freight capacity and shorter passenger times from Glasgow/Edinburgh to Dumfries & England
- extension of Borders rail route from Hawick to Gretna
- construction of a direct rail route from Pinwherry to Port Ryan and Stranraer
- construction of direct rail route from Dumfries to Stranraer

ABOUT THE AUTHOR

Tom Hart was born in Ayrshire and has always lived in the town of Beith. Educated at Spier's School, he went on to Glasgow University completing degrees in Modern History with Economics in 1961 and Law in 1963. After two years of research on problems of urban redevelopment in Glasgow, he joined the Department of Economic History and remained there until early retirement in 1998. His main teaching was in modern Scottish Economic History plus Honours Options in Urban History and Comparative Transport History since 1870.

In 1962, at the time of the imminent Beeching Report on Rail Reshaping, he was one of the founders of the Scottish Railway Development Association which became the Scottish Association for Public Transport in 1972. He has been Honorary President since 2013. He was a founder member of the Scottish Transport Studies Group in 1984 and later became Chair and Editor of the Scottish Transport Review. Other posts include being an Appointed Member of the Strathclyde Partnership for Transport.

Though starting with a study on Municipal Enterprise in Glasgow 1840-1914, his main research interests moved into historical, present-day and future linkages between transport, the economy and society. The 1960s saw a series of publications probing the actual impact of railways on the 19th century economy. Though accepting railways as a major advance, these queried the view that railways had been as important as earlier observers believed. Changes in shipping, the telegraph and industrial processes had been more important in contributing to an expanding world economy. With the Beeching Report and much enlarged road investment also appearing in the 1960s, this led to an interest in wider appraisal of future policies and programmes for rail and road, and for the emerging mass aviation sector. Oil, energy, climate change and improved local environments became important added interests in the 1970s.

Tom Hart, and others, pursued these issues in a variety of publications, including articles in Urban Studies from the 1970s. This period also saw meetings with the USA consultants employed in the Greater Glasgow Transportation Study querying the level of demand for, and net benefits from, high city-based road investment. In the end, less than one-third of proposed motorways and dual carriageways around Glasgow were built and the Beeching closure of the Argyle line tunnel through Glasgow and of other suburban services was reversed. Principal publications by the author since 1990 have included:-

- Contributions to the *Transport and Communications Sector* in Vol 2 of the *Dictionary of Scottish Business Biography,* edited by A Slaven & S Checkland, Aberdeen University Press 1990
- *Transport Policy Options for a Sustainable Scotland 2000-20*, edited jointly with Nigel Doar, Scottish Forum for Transport and the Environment 1999
- *Transport & the City* chapter in the *Handbook of Urban Studies*, edited by Ronan Paddison, Sage 2001
- Chs 8, 10, 13 & 18 (dealing with *20th Century Surface Transport in Scotland*) in Vol 8 *Transport and Communications* in the Scottish Life and Society series edited by K Veitch, JohnDonald 2009
- *Changing Trends in Passenger Movement in Scotland – How the past can influence the future* in Scottish Transport Review, Issue 47 March 2010