

TRANSPORT AND THE SCOTTISH ECONOMY: KEY ISSUES

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Introduction

1.1 Purpose

This report presents the results of a Scoping Study and seeks to identify key issues where academic research can assist in evidence-based policy making in relation to transport and the Scottish economy. Issues considered include: the links between transport and economic development; regulation and structures; travel-to-work in Scotland (including the implications for social inclusion and unemployment); problems specific to rural areas and remote communities; new technologies and transport; and appraising transport investment. It should be stressed that the focus is upon academic economic research, particularly related to economics, and it was not possible, within the time available, to consider the many other disciplines researching transport or to review current policies.

The next section briefly sets the broad context of transport in Scotland. Section 3 considers the role of transport in economic development, section 4 reviews key transport problems and potential solutions and further research required, as discussed with the interviewees. Finally Section 5 presents some brief conclusions and priorities for research.

1.2 Methodology

The report presents evidence from interviews conducted between November 2001 and January 2002 with Scottish based academics and transport practitioners with an interest in transport and the Scottish economy.

The methodology consisted of five main stages:

- desktop analysis of relevant primarily Scottish related academic literature;
- desktop analysis of public, private and organisation policy statements and relevant academic and other evidence;
- an e-mail survey with a short web-based questionnaire sent to academics & departments identified as having related research interests;
- in-depth interviews with key academics who have researched relevant Scottish transport issues;

- interviews with actors in the field, including policy makers, organisations representing the various modes of transport, industry organisations and transport service operators with an interest in the Scottish economy.

A list of consultees is given in the appendix 1. In total our sample consisted of: responses from 15 leading academic transport economics specialists (30 were contacted); and 23 interviews with key actors.

2. A brief overview of transport in Scotland

2.1 Introduction

Transportation is undoubtedly of great importance to the Scottish economy. Scotland differs from much of the rest of the UK in its relative isolation from markets and centres of economic activity in southern England and the European 'core'. Within Scotland, the concentration of economic activity in the central belt and the other major cities is reflected in intense demand for transport and pressure on infrastructure in certain places. Elsewhere the problems are more concerned with peripherality and length and cost of links to the main economic centres both within and outwith Scotland. Further significant issues are social inclusion, direct employment in transport and the links between transport and the environment. Current policy issues of particular importance are:

- external links – including existing, new or 'missing' air, sea, road and rail links to the rest of the UK and beyond;
- intra-Scotland linkages, particularly for more peripheral areas, but including some 'bottlenecks' and 'missing links' in central areas;
- congestion, particularly within the main conurbations;
- promoting social inclusion by increasing labour market connectivity;
- direct employment in transportation industries such as rail, air, shipping and road building, plus their multiplier effects;

- links between the environment, transport and the economy (including possible effects of global warming and the effects of environmental policies).

Within the UK context Scotland has many distinctive features that present particular transport challenges.

- Geography - physical geography of mountains, islands, lochs pose challenges;
- Population settlement pattern - Scotland has a third of the landmass of Britain and a tenth of the population. Its main cities (Glasgow, Edinburgh) with their characteristic high-density tenement blocks have higher population densities than cities in the rest of Britain. This contrasts with some of the lowest population densities in many of Scotland's remote areas (Ryley and Smyth, 2000).
- Peripherality - Scotland lies on the fringe of the UK and Europe, which places a heavy emphasis on road, rail and air links to locations in the rest of the UK and Europe. It is also a 'cul-de-sac' region, with no land routes passing through it to other areas, other than to Northern Ireland.
- Lower car ownership and access rates – 34% of Scottish households did not have access to a car in 2000, compared to 27% in Great Britain. Only the northeast of England had a higher rate. (*Transport Statistics Great Britain: 2001*).
- With the advent of devolution and the Scottish Parliament, there is greater potential for the development of locally responsive policies.

The rest of this section considers:

- Transport's direct contribution to employment and GDP
- Trends in Transport
- Finance.

2.2 Transport's direct contribution to employment and GDP

Direct employment in transport in Scotland was 118,000 or 5.3% of the work force in 2000 (Table 1). The absolute figure was static from 1999 and up on 1998.

Table 1: Employment in transport and communications, Scotland, 1998-2000

	1998	1999	2000
Employment Total (000s)	2,141	2,122	2,229
Employment in Transport & Communications (000s)	113	118	118
Employment in Transport & Communications as % of Total	5.3%	5.6%	5.3%

Source: ONS Annual Business Enquiry

In terms of Gross Domestic Product, transport related industries accounted for just over 7% of GDP in Scotland in 1998, a rise over the period 1996-98 (Table 2). Transport therefore directly accounts for a small but significant proportion of employment and GDP in Scotland. It should be noted that these figures do not include employment in distribution or transport related manufacturing (such as car assembly) or construction (for example, road building), or the multiplier effects of employment and efficiency. Critically they do not indicate the efficiency gains for the Scottish economy from good and well-managed transport infrastructure. Such an analysis is outside the scope of this study, but the effect is that these figures underestimate the importance of transport.

Table 2: GDP share of transport industries (£m), Scotland, 1996-1998

	1996	1997	1998
Total GDP	57,338	58,650	62,153
Transport, Storage and Communication GDP	4,113	4,292	4,649
Transport, Storage and Communications. as % of total GDP	7.2%	7.3%	7.5%

Source: ONS

2.3 Trends in transport

2.3.1 Transport movements

One of the main issues giving rise to this study is the question of whether increased transport movement is associated with economic growth. Table 3 shows that there has been a steady rise in transport activity over the past decade (1990-2000). Particular points of interest are that:

- road traffic has increased by over 15%, however, the growth was concentrated in the first half of the 1990s;
- the increase in car traffic has been slightly less than that of all road traffic, but has remained around 80% of total road traffic across the period (more detailed breakdown reveals the largest growth component has been Large Goods Vehicles, up from 9% to 11% of total traffic). Again the growth was concentrated in the first half of the 1990s;

- rail and air passenger movements have increased, whereas bus and water passengers have fallen;
- the largest percentage increase has been among air passengers but rail passenger growth has also been substantial (before the recent rail disputes and safety concerns);
- there has been an increase in freight movement by road rail and water, and a 78% increase in the quantity of air freight lifted;
- only the increase in air passengers and air freight is greater than the increase in GDP, reflecting partly changes in inwards and outwards tourism, and changing industrial structures and logistics.

Although the time period is short, air travel appears to be growing at a rate faster than GDP. This may be due to an exponential relationship with economic growth and/or factors independent of GDP growth (such as a reduction

Table 3: Trends in transport movement, Scotland, 1996-2000

	1990	1996	1997	1998	1999	2000	Change
Major Road Traffic (million vehicle km)	21,786	24,487	24,676	25,597	25,433	25,195	15.6
Car Traffic (million vehicle km)	17,476	19,416	19,564	20,309	20,081	19,923	14.0
Bus Passenger Journeys (million)*	613	494	467	438	413	431	-29.7
Rail Passenger Journeys (million) §	54.8	57.9	59.3	62.6	64.6	67.5	23.2
Air Passengers (000s)*	10,300	13,561	14,685	15,459	16,144	16,967	64.7
Water Passengers** (000s)	8,151	7,794	8,323	7,934	7,948	N/A	-2.5
Road Freight Moved (million tonne km) †	12,309	14,163	14,236	14,856	14,988	14,817	20.4
Rail Freight Moved (million tonne km)	N/A	N/A	1,437	1,415	2,069	2,046	-
Air Freight (tonnes)	43,622	50,494	63,135	72,280	77,168	77,592	77.9
Water Freight Traffic (million tonne km)	20,085	30,160	27,200	30,400	27,690	N/A	37.9
Scottish GDP (£m current prices)	39,999	57,338	58,650	62,153	64,050	N/A	60.1

*In financial year ending that year (i.e. 1989/90 to 1999/00)

**Main services (Services to Northern Ireland + All Cal Mac, P&O and Orkney Ferries)

§ 1990/91 figure (1989/90 figure distorted by industrial action)

† Journeys originating in Scotland

Sources: Scottish Executive Scottish Transport Statistics (2001); ONS (2000)

in air travel costs) (see below for business travel figures). It is important to consider whether the marked reduction in road traffic growth since 1995 is the result of a fundamental change in its relationship with economic growth, or a short-term anomaly. However, National Travel Survey data, discussed below, indicate that the longer-term link between GDP growth and travel is more complex.

2.3.2 The National Travel Survey

The National Travel Survey results for 1998/2000 (Statistical Bulletin: Trn/2002/3 Travel by Scottish residents: some National Travel Survey results for 1998/2000 and earlier years, April 2002, Scottish Executive) provide a useful picture of trends. It shows that on average in 1998/2000 a Scottish resident travelled around 7,200 miles per year within Great Britain. This is 55% more than around 15 years ago in 1985/86 or 72% more than in 1975/76 (around 85% of this increase was accounted for by cars) (Appendix 2 Tables A-C). This is primarily due to an increase in the average trip length of 42% between 1985/86 and 1998/2000, as the average number of trips per person per year rose only 8% in this period (the figures for change from 1975/76 were 45% and 20% respectively). The average time spent travelling per person was 359 hours per year (59 minutes per day) in 1998/2000 (up 24% compared to 1975/76).

There has been a major shift between modes of travel with cars clearly dominant. They accounted for 73% of total distance travelled in 1998/2000, (with the next highest modes being surface rail and local bus at only 6% each). Between 1985/86 and 1998/2000 the average numbers of trips per person made as a car driver rose by 79% and as a car passenger by 35%, while walking fell significantly (down 28%) as did local bus travel (down 30%).

Of particular interest to this study are the purposes of travel. Shopping was the most frequent purpose in 1998/2000, accounting for 22% of trips per person per year. Commuting or business purposes accounted for 19% of trips. Between 1985/86 and 1998/2000, the average distance travelled per person rose by 94% for shopping trips, by 92% for other personal business (e.g. visits to a doctor, library or church), by 42% for commuting and by 58% for holidays and day trips. However, Business Travel 'only' rose by 31% over the 15 years and actually fell

fractionally during the last decade, between 1989/91 and 1998/2000 (partly due to the economic recession). Congestion affects business in terms of efficiency of travel (e.g. to customers are suppliers) and access to labour, but most of the increase in congestion over recent decades is linked to personal travel, including commuting.

The number of commuting trips per person actually fell by 7% over 1985/86 to 1998/2000 (to 167 per person per year), while business trips (in cars, vans, lorries etc.) rose 15% (to 31 per person per year). By contrast there was an increase in shopping trips per person, rising by 24% to 234. So while economic growth (GDP) has increased substantially (36%) during this period, business travel has increased much less, while other travel such as commuting, shopping and other personal business has greatly expanded. The problem of increasing car use is predominantly not linked to direct business uses by people, although road freight has been increasing (but at considerably less than the rate of GDP growth).

Hence there is no clear proportional link between growth in business travel and GDP. The link rather would appear to be between increased income (associated with GDP growth) and travel. These include activities with a high income elasticity of demand, (such as car ownership or leisure shopping), rising numbers of workers in households (and linked journeys such as school run-work-shopping), deterrence (e.g. children not cycling to school due safety concerns influenced by increased car numbers), changes in the organisation of services (e.g. concentration and increased size of hospitals, schools, shops, leisure facilities etc.), and land use decisions etc.

Business and commuting trips are however predominantly by car (71% of them in 1998/2000) compared with 11% by walking, 14% by public transport and 4% by other private transport (e.g. motorcycle, bicycle or private bus). In terms of distance, cars accounted for 74% of all business and commuting travel and public transport 23%. Interestingly over 80% of shopping distance travelled was as a car passenger or driver.

The National Travel Survey argues that the main reasons for the increase in car travel are that there are more cars, and more people able to drive them. The number of cars and other vehicles available rose by 85% from 1975/76 to 1998/2000 (from 52 to 96 vehicles per 100 households

while household size was falling). At the same time the percentage of the adult population qualified to drive motor vehicles rose from 66% of men and 24% of women to about 78% of men and 58% of women. Meanwhile, the average mileage per car has not changed much.

In terms of UK travel links, Ryley and Smith (2000) note that the percentage split for travelling long-distance between Scotland and the South East of England was 20% car, 14% bus, 28% rail and 38% air. This is a relatively even split between the four modes and shows that Scottish residents have a choice in the mode of transport should they wish to travel to the South East of England.

2.4 Finance

Public Finance for transport decreased in the last 5-6 years (Appendix 2 Table D). Total expenditure on transport within Scottish Ministers' responsibility in 1999-00 was estimated at £325 million, a third (34%) less than in the recent peak year of 1993-94. Within this, total capital and current expenditure on motorways and trunk roads in 2000/01 was estimated at £166 million, some 33% down on the recent peak expenditure in 1994-95 and local transport gross expenditure on new and improved roads and public transport investment fell from £201 in 1994/95 to £112 in 1999/2000. Expenditure on transport controlled by local authorities has also fallen since the mid-1990s, down 22% to £384 million (excluding loan charges) in 1999/2000.

These figures highlight the decrease in spending by both national and local government on all forms of transport infrastructure over the past 5 years. The only area to show an increase over this period is Central Government subsidies to transport (such as air and sea travel to remote areas). This points to a need for more research on reasons and appropriateness of recent trends in public sector transport spending.

2.5 Summary

Research is needed on the main trends in transport and on in-depth analysis of existing data. For instance, longer-distance and rural area road traffic appears not to be rising while there is continuing growth in the Central Belt conurbation and around Aberdeen (with associated

worsening of reliability). In addition increased personal and leisure use appears to be the cause of increased traffic growth and associated congestion problems. There are large amounts of data available, primarily through the Scottish Executive, whose in-depth analysis would greatly enhance our understanding of traffic flows and changes within Scotland and between Scotland and elsewhere.

3. Transport and economic development - recent research

3.1 Introduction

This section outlines recent research concerning the apparent link between transport and economic development and examines some of the ways in which it is manifested. It seeks to particularly focus on Scotland and work directly related to the Scottish context. It draws primarily on academic literature and interviews with academics in Scotland (as this is the focus of this report), but also briefly considers some evidence from government reports and other published work. The main transport policies examined include infrastructure investment and the management of new and existing infrastructure (including changes in public transport service levels, fare structures, and issues such as road pricing, as well as changes in the infrastructure itself).

Transport and economic development of a local area or region are linked in many ways. First, there are efficiency issues related particularly to accessibility to international, UK and Scottish markets, suppliers, knowledge and labour (in terms of distances, speed, quality, reliability, risk and uncertainty, other costs), which affect employers' operations and investment decisions. These are affected by both geographical accessibility and congestion. Congestion can be seen as reducing accessibility in terms of increasing travel times and risk and uncertainty associated with journeys, and accessibility and congestion cut across most other themes in this report. Second, there are welfare issues that affect the wider 'economic costs' of peoples' commuting and other journeys, and also affect efficiency in terms of accessing suitable work (and employers getting the most suitable workers). Third there are the distributional issues linked to social inclusion, particularly in terms disadvantaged people finding and maintaining work, training etc. Fourth, there are wider economic costs to society, for instance in terms of environmental, accident and other costs.

The following sections consider:

- the links between transport and economic development in general, especially evidence from the SACTRA report and elsewhere, and the issue of displacement versus additionality;
- specific types of links between transport and economic development, especially links with labour demand, labour supply, social inclusion, and rural and peripheral areas, and;
- ‘decoupling’ economic growth and transport.

The overall conclusion is that there is no ‘one answer’ and that the impacts of transport infrastructure are contingent upon the specific circumstances (type of investment, its management, the characteristics of the local economy etc.).

3.2 General links between transport investment and economic development

The main study on transport and economic growth in recent years has been the SACTRA report. Their conclusions are briefly considered together with some other recent evidence. Then the issue of whether the results of transport investment may displace other activity elsewhere, or if it represents genuinely additional activity, is discussed.

3.2.1 The SACTRA Report:

To set the scene, we turn first to an examination of the Standing Advisory Committee on Trunk Road Assessment report on Transport and the Economy (SACTRA, 1999), which sought to determine if transport improvements lead to increased, or more efficient, economic activity and whether it is possible to ‘decouple’ growth in traffic movements from growth in the economy. It concluded that there were strong and consistent theoretical links between transport and economic growth. The following could, in principle, provide mechanisms to increase economic performance through transport improvements:

- changing labour market catchment areas to reduce labour costs;
- increased output from lower costs of production;
- stimulation of inward investment;

- reorganisation of land use;
- freeing inaccessible sites for development;
- increased competitive pressures should raise efficiency;
- triggering multiplier effects.

However, the report argued that in practice the empirical evidence to support such links was limited, and that, while possible in theory, such links were not automatic and could not be guaranteed, as their operation was dependant on local economic conditions. In particular, it was emphasised that investment in transport infrastructure was most effective where the existing level of infrastructure was poor – the economic returns to transport investment in areas with an already well-developed infrastructure would be modest (i.e. a form of diminishing returns to scale). In addition it stated that transport investment could best stimulate economic growth when it is part of an integrated economic development policy and that large transport projects may not have a positive impact unless they are linked to other policies, are carefully evaluated, and suitably fill a specific need (such as improved external links or improved reliability).

Examining the issue of whether it is possible to ‘decouple’ transport growth resulting from economic growth, SACTRA (1999) concluded that certain policy measures applied in the right way and in the right conditions could break or reduce the link. The current problem is seen as being one of ‘transport intensity’, i.e. a situation where traffic growth is rising faster than the rate of economic growth. However, such a relationship need not be linear and research would be useful to determine the forms of such relationships. There is evidence to suggest that it varies by mode (with the link between GDP and road movement weakening, but not the link between rail and air). Successful policies would be ones that could reduce or keep constant traffic growth while increasing or keeping constant economic growth. Hence, in theory at least, lower but better targeted spending with any savings appropriately invested, could boost GDP more than increased transport spending (see further discussion in section 4).

The study noted that there were established causes of traffic growth, namely: growth in income; transport costs;

transport speed; and transport quality. Policies to increase the price of transport (such as road tolls and fuel) should therefore be successful in reducing traffic (this may prove difficult to implement in practice - (Kirby *et al*, 2000) note that costs of operating a car, such as petrol, have generally fallen over the long-term). If this results in increased reliability and reduce travel times, then total transport costs could actually fall. Positive economic growth could possibly be attained by re-investing the revenue from the increased transport charges into local economic development, improved transport services and infrastructure. The study notes that monetary transport costs should only be increased up to the point where they equalled the marginal social cost of transport (e.g. congestion and environmental degradation costs) and that any increase above this level could harm economic growth. In addition there were non-price traffic reduction policies, such as pedestrianisation and increasing the efficiency of road use (for example through bus and car pool lanes) that could have economic benefits to certain economic sectors.

From SACTRA (1999), we can therefore suggest that:

- there is a link between transport growth/improvement and economic development;
- this link may be broken with the correct set of policies;
- policies to increase economic growth through transport investment must take into account local circumstances and be part of a wider economic strategy;
- the type of spending on transport, local circumstances and the links with other policies may be as or more important than simply the level of transport spending.

3.2.2 Other evidence

A wide range of other reports and academic studies has been conducted examining the existence of links between transport and economic development. Most report the existence of some links – these are examined in more detail below under their respective subject area. However, as with many fields of economic research, there is no consensus that transport improvements will automatically boost the economy. Many studies have found that links are weak or non-existent, highly conditional and dependent on precise policy implementation (as with SACTRA), or even that negative economic effects can arise.

There are also significant reverse causality effects of economic growth on transport. An issue arising was the propensity of certain types of economic development to create higher levels of traffic growth than others. In particular, decentralisation of economic activity into suburban areas is argued to make public transport provision less economical and creates traffic growth. It may also make cycling and walking less attractive, with higher related health costs over time. The point can also be made that technological change is a more important driver of transport demand than transport policy. Two examples are: the increase in Just-in-Time production methods; and the rise of global logistics and the ability to supply supermarkets with food and goods from around the world, in all seasons, that has resulted in consumer demand that transport policy has little effect on. Because of this it will be very difficult to break the link between economic growth and traffic growth.

There are also a number of academic studies that concur with SACTRA (1999) in that the effectiveness of transport improvements on economic development are considered to be dependent upon local conditions and the way policies are implemented. Most of the literature focuses on the need for a ‘joined-up’ and integrated strategic approach to the local economy, placing transport in the context of wider local economic development. Banister and Berechman (2001) argue that transport investments are necessary but not sufficient to promote economic development, which will only occur if a series of other conditions are met, namely: a buoyant economy, a stable and favourable political environment; and sufficient investment.

The transport infrastructure benchmarking study by Steer Davies Gleave for the East of England Development Agency (EEDA, 2000) reported the findings of a review of research into the effect of infrastructure on economic development. They found that built infrastructure (including transport infrastructure) is a necessary but not sufficient condition for improving economic performance. The main role of infrastructure investment was reported to be to facilitate economic growth in situations where rapid economic expansion was being held back by ‘bottlenecks’ in infrastructure. This was most likely to occur in economies where existing infrastructure provision was underdeveloped. Investing in infrastructure in conditions of low economic growth and where basic infrastructure provision was already in place was

unlikely to boost economic activity. In addition they found that infrastructure investment needs to be continuous to ensure economic growth

The report by the Organisation for Economic Co-operation and Development into the impact of transport infrastructure investment on regional development (OECD, 2002) found that social inclusion was unlikely to be achieved through improved accessibility and transport investment alone, but could best be achieved as part of an integrated range of initiatives including transport, skills, housing and social policy. Other examples include Lawless (1999) and Lawless and Gore (1999) who note that the effect of transport investment on regeneration has been weak due to a lack of co-ordination between regeneration and transport policies.

In terms of organisation, Primus and Konings (2000) state that improvements in public transport will only aid urban renewal if local transport policies are linked to the national transport network and controlled by local authorities in consultation with other bodies including other local authorities, transport operators and property developers. There are also problems inherent to the implementation of integrated investment. For example, Graham and Guyer (2000) note the difficulty of integrating air services into regional development plans. Another widely accepted issue is the need to examine cross elasticities of travel modes before economic benefits of investment are estimated. Williams (1998) illustrates this through the use of a general equilibrium model of highway investment policy, concluding that if conditions are right and alternative modes of transport are available a reduction in road capacity can *reduce* congestion. Hence the context within which any transport change takes place is crucial to determining what impacts there are on the economy.

There have also been a number of studies investigating the effects of transport on economic and social indicators other than business growth or the labour market. Villaverde Castro and Coto-Milan (1997) used a combination of an empirical survey of businesses and input-output table analysis, to analyse the link between the development of port facilities and regional GNP growth, concluding that the contribution of the port facility is in line with that of other service industries. Van den Berg and Pol (1998) found that High Speed Train developments can help inner-city regeneration, although as

mentioned above, developments must be tailored for the needs of each city to avoid displacement. Tompkins *et al* (1998) studied the effects of the impact of an airport on the local property market using a regression of property prices on a range of variables – property prices were chosen to reflect the net range of positive and negative influences such as access, employment infrastructure, noise and congestion. They concluded that the positive effects of proximity to the airport, for example better employment and access, more than offset the negative aspects such as noise.

3.2.3 Displacement versus additionality

It has long been recognised that many of the growth claims attributed to new transport infrastructure may be questionable. For instance, a new road may be followed by the development of new industrial buildings or offices nearby. However, this development may simply have moved from or happened elsewhere in the region (*displacement*) or perhaps it would have happened anyway (i.e. the development is not additional, it is ‘*deadweight*’). Even in the case of inward investment, such investment may simply be changed from one part of the region to another due to the new transport infrastructure. It is crucial to identify any displacement and the geographical area of analysis for which displacement should be calculated (e.g. a local area, a travel-to-work area or a wider region/country such as Scotland). One example is that when firms were asked why they had located in Newbury, they claimed that proximity to the M4 motorway was important, however, on further probing, that only explained why they were located in that local area and did not explain why they had decided to locate in that region (Hall *et al*, 1988). Transport infrastructure may be a necessary but not sufficient condition for development.

The OECD (2002) report also highlights the need to distinguish between overall growth and the redistribution of benefits following an investment in order to avoid double counting. To expand on this, an investment in transport is likely to have two impacts on the immediate locality:

- there will be genuine additional economic growth brought about through lower travel costs, increased efficiency, extra employment and social inclusion, and the indirect and induced impacts of these;

- as discussed above there will also be a movement, or ‘displacement’ of economic activity away from areas with less well developed infrastructure, or where investment has not been made.

In the latter case, there is no net economic benefit *ceteris paribus*, as the activity has merely been moved from one geographical location to another. Any benefit will be dependent on the nature of the areas in question – a redistribution of activity from a congested area to a less well developed area will help spread growth evenly and help ease inflationary or capacity pressures. However, it has already been noted that transport investment is not, by itself, an effective method of promoting economic activity in low growth areas. Alternatively, displacement of economic activity resulting from transport investment may take place in the (less desirable) form of movement from low growth areas to high growth areas that have benefited from investment to remove ‘bottlenecks’. It is therefore important that such displacement of activity is not counted as a benefit alongside the genuinely additional growth created in areas benefiting from investment.

Several studies have considered this issue. EEDA (2000) noted that investment in infrastructure is likely to promote centralisation rather than dispersal of economic activity and will thus benefit areas least in need of economic expansion. Van den Berg and Pol (1998) conducted an international comparison of 14 European cities to examine the impact of High Speed Train (HST) provision on economic development potential. It was found that developments must be tailored to the individual needs of each city to avoid displacing economic activity from areas without a HST station. Graham and Guyer (2000) in an analysis of passenger trends and flights in regional UK airports in the context of the 1998 UK transport white paper found that the development of regional airports can create job displacement within the region.

In Scotland, the STAG guidance and national planning guidance on Transport and Planning, PPG17, (see below) raise many of these issues. If benefits are redistributed to an area of greater need, STAG would count this as a benefit unless it was clear that Scotland would lose out entirely if growth did not go to more prosperous areas.

3.3 Specific links between transport and the economy

This subsection reviews literature that supports a link between transport investment and economic development and performance. It examines the effects on labour demand (indigenous firms and inward investors), labour supply, social inclusion and rural and peripheral economies.

3.3.1 Effects on labour demand - indigenous firms and inward investors

The OECD (2002) study argued that improved accessibility (defined as the quantity of economic or social activities that can be reached using the transport system) could result from transport infrastructure investment. This could increase the market size for industry resulting in increased competition and market opportunities and leading to increased productivity among firms who adapt to the changes brought about. It also found that transport investment will result in time and cost savings and increased reliability which should raise the efficiency of production and distribution activities. It should be noted that similar arguments can be made concerning improvements to the management of infrastructure or the wider transport system. However, the level of benefits will depend upon the specific characteristics of the changes and local circumstances.

There is limited recent academic evidence on transport and employer location in Scotland. Leitham *et al* (2000) carried out an empirical stated preference study of 40 firms in west-central Scotland. They found that different types of firms (e.g. foreign inward investors, UK inward investors and local firms) varied in their views as to the importance of transport and of different modes, and of different proposed transport infrastructure investments. Similarly, using different data, Button *et al* (1995) in an empirical study based on a survey of 939 firms in new premises in west-central Scotland found that there were important differences in the type influence of different types of transport infrastructure investment on firm location. Road and air infrastructure had a greater impact on inward investment than endogenous firms, (with roads particularly important for UK headquartered inward investment and airports for overseas inward investment). Bus links had a greater importance for large firms (probably for travel-to-work for lower skilled workers). They found that poor transport infrastructure did not

induce firm migration but influenced location decisions once firms had decided to move.

McLintock (1998) investigated the role that transport investment had on economic development and found that while there was no evidence for a link between road infrastructure and economic development, investment in sustainable (i.e. public) transport made towns and cities more attractive business locations. Priemus and Koenings (2000) agreed, arguing that improvements in urban public transport are vital for urban renewal, leading to increased business activity. However, contrary to McIntock, in the Netherlands Bruinsma *et al* (1997) used a regional labour market model and a survey of entrepreneurs to estimate the effects of road construction on local businesses. They found that road infrastructure investment had a positive effect in terms of corporate investment, attracting and retaining employees, travel and delivery times and perceived accessibility. Perceived accessibility is seen as being equally, if not more, important than actual accessibility as it is perceptions that most often influence location decisions.

EEDA (2000) also noted that investment in infrastructure may alter the perceived accessibility of places, thereby attracting inward investment, regardless of any change in actual accessibility. This was noted by Scottish academics in relation to air and rail infrastructure (see below). EEDA (2000) also stated that transport infrastructure can play an important role in supporting industry clusters by increasing labour catchment areas and enhancing intra-area interactions. In relation to inward investment, they found transport investment to be an important factor in firms' location decisions, and therefore a useful policy for regions competing for mobile investment.

Concerning air travel, Adams and Raeside (2001) conduct a critique of current air passenger forecasting techniques and the policy implications of this. They found that any policies to constrain air transport demand in Scotland are likely to be economically damaging as the environmental benefits are outweighed by the opportunity costs and that the most effective way to reduce congestion and emissions would be to provide public transport to air terminals. They noted that the tourism and electronics industries are very dependent on air transport. From this it would appear that investment in airport infrastructure together with supporting public transport infrastructure would provide both economic and environmental benefits

to Scotland. Hakfoort *et al* (2001) employed a social accounting matrix (an extended input-output model looking at production, employment and consumption) to examine the effects of the expansion of Schipol airport in Amsterdam, by comparing actual economic growth with projected growth assuming there had been no increase in aviation activities. They found that growth of the airport did lead to a growth in employment and that the multiplier effect of direct employment on the airport was 2:1 (i.e. 2 jobs are created indirectly for every extra job in the airport).

Baird (2000) conducted a review of economic impact studies of ports in the North Sea Region and found that the direct, indirect and induced employment impacts of ports tend to be greater than in many other economic sectors. The impact depends on factors including the type of cargo handled and the local concentration of value added industries such as storage, construction and navigation. He found that major port investments deliver immediate employment and, in line with OECD (2002), that the employment impact increases with port throughput.

The OECD (2002) report also found that transport infrastructure investment can result in increased employment in a region due to construction, operation and maintenance activities. All these activities can also have indirect and induced employment spin-offs. In the case of the operation and maintenance of transport infrastructure, the direct and indirect employment opportunities were found to be proportionate to the level of traffic.

Interviews with academics in Scotland supported many of these findings. Some of the key issues arising during the interviews were:

- Investment in sustainable short haul freight distribution strategies in towns and cities will be essential to keep business traffic moving, especially with the predicted growth in home shopping and LGV movement.
- Investment in public transport infrastructure in urban areas reduces car dependence and congestion caused by commuting, thus freeing up space for business traffic, particularly at peak hours.
- The need for improvements in the range of direct services from Scotland to destinations and international

hubs outside the UK (see below), in order to assist economic development.

- Investment in airport infrastructure and connections from the airports to the major urban centres and other areas is important to ensure the competitiveness of Scottish cities compared with European rivals in securing Foreign Direct Investment, promoting indigenous development and for sectors such as tourism. For tourism the benefits of links are in two directions (as residents may take more frequent foreign holidays, so reducing local spending, as well as attracting in tourists from elsewhere). Additionally, high value companies need to move senior staff internationally, and a high quality international airport creates a strong image for a city, with subsequent spin-off benefits.
- In the remote parts of Scotland the issue of the quality, range and price of air services is particularly important. The degree of indirect public subsidy (e.g. local authorities, local enterprise companies and the Health Service often insisting that their staff take more expensive tickets, in effect subsidising the air links from non-transport related budgets) is worth further study. Linked to this it would be useful to investigate the opportunities for possible cheaper fares for the general public.
- Investment in the Scottish port infrastructure will have tangible benefits in terms of increased direct, indirect and induced employment, increased business efficiency and may also create new demand for transport to and from Scotland.

3.3.2 Effects on labour supply

This section reviews the links between transport investment and the supply of labour in terms of travel-to-work patterns. The OECD (2002) report concluded that accessibility was one of the wider benefits from transport infrastructure investment. It found that improvements in accessibility can increase the market size for labour, but noted that this could have positive or negative implications for the region in question (for example, if an area of high unemployment was opened up to increased labour market competition). However, issues such as education and skills are likely to be more important in finding work (e.g. McQuaid *et al*, 2001). Bruinsma *et al* (1997), as stated above, found that road construction was beneficial to travel and perceived travel times. Hamilton and

Jenkins (2000) conducted an analysis of secondary data sourced mainly from UK government statistics and found that poor transport limits women's employment and quality of life, as women rely more upon trip-chaining and off-peak travel (due to part-time work). They suggest that reforming public transport to meet the needs of women would have commercial, inclusion and environmental benefits.

Houston (2001) conducted a retrospective longitudinal study of firms who relocated to decentralised locations within the Glasgow conurbation. He found that when firms relocated to decentralised locations difficulties were created for certain groups of workers that could not relocate or move house, particularly lower paid and lower skilled workers and those dependent on public transport, especially women. Houston stated that improvements in transport infrastructure would partially alleviate this, however, there is a problem in that decentralised locations are more difficult to service by public transport. This last factor is a concern expressed by many academics interviewed, below, and one that we consider in section 5 later.

Interviews with academics pointed to the following labour supply issues as being of concern:

Travel-to-work is not yet seen as such a major problem in Scotland compared with many other areas of the UK such as South East England. However, arguments that the Central Belt of Scotland should be seen as a broad single labour market for many occupations (particularly to spread the benefits of economic growth in the East to residents elsewhere) may be altering this view. There is a need for research into the concept of a Central Scotland labour market and the associated transport issues.

Investment in transport information technology, rather than additional physical infrastructure, such as urban road speed maps, public transport information systems and even clearer public transport mapping, can reduce congestion and improve economic efficiency.

If public transport infrastructure is provided integrally into new business developments from the outset then congestion and travel times can be reduced. Green commuter planning is one aspect of this.

Suburbanisation of employment affects commuting patterns, makes employees more car dependant and can create congestion. Reliance on cars means that parking space is at a premium and can be a barrier to commuting. There may also be social inclusion issues, as those

without cars may not have adequate access to employment opportunities or facilities (e.g. the new Royal Edinburgh Infirmary in Little France on the outskirts of Edinburgh).

Investment in high quality intra-city rapid transit is effective in slowing down suburbanisation sprawl and concentrating population in more sustainable city areas. This will also safeguard higher income inner city residential areas by ensuring their attractiveness to employed people, the net result being that employees will be concentrated around nodes of public transport, thus improving travel times and reducing congestion. Rural areas present particular problems in terms of accessibility to employment and other opportunities (see below).

3.3.3 Effect on social inclusion

A related problem to the above is that transport problems act as a barrier to socially excluded people seeking employment. The OECD (2002) report concluded that transport infrastructure investment could have positive (through increased accessibility and mobility) or negative in its effect on social inclusion within a region. Grant (2001) argues that transport for those who do not have access to a car is most effective if addressed at a community level to prevent increased exclusion.

There have been numerous studies in the US which have identified the problem of employment shift to suburban areas not served by public transport creating problems for inner-city residents, particularly blacks and manual workers, including Zax and Kain (1996) (see, for instance, Holzer (1991) for a wider discussion of spatial mismatch). Goldenberg *et al* (1998) found that transportation services made a difference in allowing people to obtain work. Other studies identifying disadvantaged groups include the Select Committee on Education and Employment (1998), which reported that lone parents were at a disadvantage in getting to work as only 35% have access to a car, compared with 90% of couples with children. In addition, the 'household responsibility hypothesis', that women face constraints in their travel patterns, and hence employment opportunities, due to the burdens of household responsibility has been advocated by Pickup (1989) and Turner and Niemeier (1997) (see McQuaid *et al*, 2001, for some limited Scottish evidence on this, which considers the effects of

lack of skills, education, transport availability, etc.). Clearly issues of cost, scheduling, comfort, security, and knowledge of transport alternatives is important (particularly with the increase in shift and weekend working).

Some areas, such as Fife have introduced information services for those considering taking a job, but not knowing public transport accessibility, and schemes to subsidise travel to new jobs are relatively common. In rural areas particularly, the lack of driving licences among job seekers is important. Levels of private transport ownership were low amongst both sample groups (35% in Wick and Sutherland and 34% in West Lothian) (Employment Research Institute data). In both areas the long-term unemployed were also more severely disadvantaged in terms of the availability of private transport (21% in Wick and Sutherland and 22% in West Lothian). Despite the majority of these job seekers holding current driving licences, comparatively few had access to their own transport. Perhaps predictably, the cost of owning and running a vehicle was cited as the main reason for this apparent paradox. Indeed, for 53% of those in Wick and Sutherland (and 36% in West Lothian) the 'costs associated with private transport' were viewed as an 'important barrier to work'.

Other Scottish studies which have sought to identify transport-related barriers to social inclusion include McGregor and McConnachie (1995), who argued that a shortage of local jobs and lack of transport to areas of employment are two main factors contributing to spatial concentration of disadvantage. Similarly, McGregor *et al* (1998) found that travel problems, connected with child care, low wages and part-time work can act as a barrier to employment and that some employers also discriminated on travel-to-work grounds.

There is a debate concerning the practicality of equipping residents in areas of multiple deprivation for jobs in the wider economy as they suffer severe limits to how far they can travel-to-work. However, there seems to be some confusion in the literature about what is meant by this. Many policy actors and researchers would consider 'the wider economy' to include those jobs in (for instance) the city centre, and hence this policy would include linking peripheral estate residents to city centre jobs. There is evidence that while there is a distance decay in terms of where people work, a high proportion peripheral estate residents do work in the city centres, where transport links and job opportunities are relatively high.

There are a number of micro-level studies that have sought to determine the effectiveness of specific investments in addressing social inclusion. Zenou (2000) used a theoretical model based on the residence of workers relative to employment in a monocentric city and found that improving transport by subsidising commuting costs of all workers reduces urban unemployment, but increases inequality, whereas a policy of subsidising transport for only the unemployed reduces inequality but increases unemployment. Hine and Mitchell (2001b) argue that improvements to transport services can help promote social inclusion – groups who stand to benefit are the elderly, those without a car who live in peripheral estates, low income groups, bus users and women. Interestingly, Stafford *et al* (1999) found that possession of a driving licence increased the chance of finding work among men and women aged 18-24. This may not always be because of travel-to-work problems – a driving licence may be an essential part of an employer's person specification and be seen as a proxy for motivation. On a larger scale, Adams and Raeside (2001) argue that policies to constrain air travel demand in Scotland would result in a reduction in flights offered by low cost airlines – these airlines not only create employment, but help promote social inclusion (in leisure activities) by providing cheap travel.

However, there are studies that have highlighted that travel problems are only part of the array of barriers faced by socially excluded people. McQuaid *et al* (2001) conduct an analysis of unemployed job seeker potential travel-to-work times and found that socio-economic factors such as gender, dependent children and education were more influential in determining potential travel times (and hence the chance of gaining employment) than provision of public transport, accessibility or access to private transport.

It is also worth noting that there is a body of opinion that promotes the use of Information and Communication Technology (ICT) to overcome problems of social exclusion caused by lack of mobility. For example, SACTRA (1999) reported that there is a role for telematics to substitute for journeys, to facilitate initiatives such as community car clubs, to provide 'on demand' special transport and improve information on public transport routes and times. Grieco (2001) argued that there is potential for ICT to enhance the mobility of socially excluded people through: quality information and

timetabling; intelligent and in-home reservation systems; on demand transport for those working unsociable hours; expanding the role of the third sector through private car use where deregulated bus services fall short of service requirements; and through the extension of car clubs to cover low income areas. Carter and Grieco (2000) argued that ICT provides opportunities to break down gender, class and racial boundaries, assist in delivery of the New Deal and improve the transport environment.

Academic interviews revealed that there was also some consensus that transport barriers to employment were a problem in Scotland. Key issues arising are:

- The spatial mismatch issue. Residents of deprived city areas find it difficult to access employment opportunities as many do not own a car, low wages make long journeys uneconomic and many jobs are situated in outlying areas that involve cross-urban (radial) travel.
- This is exaggerated by the fact that many of the city centre jobs generated over the past 20 years have been medium/high skilled service jobs and not of a type accessible to the majority of inner city residents.
- Investment in public transport, together with measures to concentrate employment and population in sustainable areas can help alleviate this by ensuring the critical mass to make public transport economic to operate.
- Investment in provision of public transport to provide mobility to the elderly is important as older people are important to the Scottish economy, both in terms of domestic spending and as tourists from abroad.

3.3.4 Effects on rural and peripheral areas

Academic evidence has highlighted a number of issues regarding transport investment and economic development in rural and peripheral areas. EEDA (2000) note that investment in infrastructure may alter the perceived accessibility of places, particularly peripheral areas, which may be perceived as less peripheral after a major investment, regardless of any actual changes in accessibility. As mentioned earlier, Monk *et al* (1999) found that unemployed residents in rural areas found that lack of access to private transport was a barrier to gaining employment, as public transport provision in these areas was inadequate.

There were differing views on the importance that should be attached to transport (or wider communications) investment – including information and communication

technologies or ICT) investment in rural areas, although it was generally accepted that key trunk routes were a priority. Specific topics highlighted were:

- Spending on expensive ‘mega-projects’ in the Central belt can be at the expense of key rural accessibility projects such as the A9 and A96 upgrades.
- Investment in transport infrastructure – public transport or roads – in rural areas is not always money well spent as the population sizes do not make it sustainable. Rural living is a choice and residents cannot expect the same level of services as those in urban areas.
- Regarding rural road pricing, the Skye Bridge Toll has had negative economic effects in terms of lost tourism business that may outweigh the benefits of the bridge itself. This stems partly from tourist perceptions that the bridge represents poor value for money when compared with the ferry crossing. Many people are hence reluctant to visit Skye. However, in recent decades Skye has seen notable population growth, from well before the bridge was opened, and it is unclear of the role of transport in this growth.

In general, academic interviews pointed to some consensus that there is a need to have a strategic policy of providing transport infrastructure to stimulate economic growth, rather than retrospectively once problems arise. But this should not take the form of predict and provide road building – any investment must be sustainable.

3.4 ‘Decoupling’ transport and economic growth

3.4.1 The existence of links?

Some research has questioned the existence of links between transport and economic development (see section 2). McLintock (1998) analysed the impact of sustainable transport on economic development and concluded that there was no link between road infrastructure and economic development. Vickerman *et al* (1999), in a study of accessibility, found that the development of Trans European Networks (TENs) did not significantly promote convergence in accessibility and economic development. Lawless (1999) and Lawless and Gore (1999) found that transport investment in the form of road and tram networks in an urban area had a minimal effect on regeneration, although Lawless (1999) found road investment to be slightly more effective.

In a U.S. study of the effects of the MARTA transit network in Atlanta, Bollinger and Ihlanfeldt (1997) found that the network had no significant impact on the population or employment level in the local economy, although it did alter the composition of employment towards the public sector in some areas. Extension of such types of study would be useful in the Scottish context, for example concerning the proposals for light rail/ trams in Edinburgh, and the distributional implications of such investments on areas of high unemployment. Little academic work has been carried out into issues such as the impact of Bus Greenways in cities on the accessibility of peripheral areas in the cities (especially areas of multiple deprivation in peripheral estates), and more ex-post analysis is needed.

McCalla *et al* (2001) in a study of inter-modal freight terminals, found that investment in freight terminals had benefits for only a modest proportion of local businesses and that very few local businesses said that the terminal was the primary location decision factor. Finally, Oosterhaven *et al* (2001), in a study of industry clusters, found that transport was not key to clustering of economic activity in terms of linkages and recommended that there is a need for economic policy makers to downgrade the perceived importance of major new transport infrastructure developments. There have been macro-level studies seeking to link transport infrastructure to economic growth, but the evidence is uncertain and open to debate (Aschauer and Mundell debate in the early 1990s).

When considering ‘decoupling’ there appears to be still some bias towards evaluating investments rather than applying the STAG evaluation to alternative management schemes such as road pricing – including looking at both the direct benefit for reliability and traffic reduction and possible indirect benefits through the ways in which income is used. SACTRA does express some fears that road pricing could lead to excess infrastructure investment where funds might be better used in other projects or in reducing national or local taxation. This can apply to ‘big’ rail or airport schemes as well as roads.

3.4.2 Negative links

Other research has shown that transport investment can have a negative economic impact. McLintock (1998) found that reducing spending on roads frees up re-

sources for expenditure on other economic development initiatives such as job creation. Noland and Cowart (2000) performed a two stage least squares analysis to model the induced effect of highway capacity, measured by lane mile additions, on vehicle miles travelled. They found that lane mile additions contributed to vehicle miles travelled – on average contributing to 15% of the increase, thus partly offsetting the benefits of highway construction. Ryuzo (2000) identified that investment in road infrastructure in Japan is reducing economic activity clustered around stations as businesses relocate out of town. Also upgrading of bullet train services has led to the demise of tourist resorts now perceived as being too near Tokyo. In a study of air transport Graham and Guyer (2000) found that expanding regional air services can have negative pollution and congestion effects, although there may be significant employment effects.

Interviews with academic specialists provided further evidence that there may be negative links between transport and economics development in some locations or sectors. A fundamental issue raised was that as travel is a cost to the economy the most effective way to reduce this cost is to reduce the number of trips, as reducing the cost of travel may only increase congestion and reduce efficiency. The decision as to whether transport should be subsidised or charged for (for example through road user charging) will depend on whether market imperfection has resulted in transport that is overpriced (such as through a monopoly provider) or underpriced (due to uncharged congestion or environmental externalities). In addition to this, the following issues arose:

- Road building schemes can act as ‘two way corridors’ by sucking development and people from smaller to larger areas, as happened in the US when a highway was built into the Appalachian Mountains to regenerate the area. This argument could be relevant for certain investment such as improving the A1 where Newcastle could be considered a more accessible location than Central Scotland for servicing the north of England and Scotland and so services in Scotland could move there.
- High levels of road spending, given the limited resources available to local and national government, can restrict funding to other essential areas such as health, education and business development. This, however, depends on the opportunity cost of the investment and on political and other priorities.

- Major trunk road building can have the effect of reducing congestion if the investment is to complete a bottleneck gap in the existing road network. Completing the bottlenecks not only reduces travel time, but also can reduce uncertainty. For example, a reduced bottleneck may reduce average travel times by minutes, but may also reduce the uncertainty associated with getting through the area and hence the amount of time a traveller must leave for the journey. However, when the investment is for a completely new road, this may lead to increased traffic generation or simply shift the congestion points, with subsequent negative impacts for the economy. Also new or improved roads may generate further development alongside (additional or displaced development), so generating further traffic.
- On a similar note to the SACTRA comment about additional transport infrastructure adding lower value added in areas already well provided for, traffic reduction schemes may lead to economic growth being stifled in less accessible areas (e.g. remote rural areas), but in urban areas traffic reduction schemes are likely to reduce congestion and therefore increase economic efficiency. Again this brings together the two issues of congestion and accessibility, with single policies affecting each differently in many cases.

There have been projects that have used this last point to try and promote economic growth. San Francisco County Transportation Authority began a scheme of freeway demolition in the 1990s following earthquake damage, replacing them with boulevards incorporating pedestrian walks and tramways. The benefits that arose from this have included: improved accessibility via all modes of transport; reduced levels of traffic and congestion; higher pedestrian footfall leading to increased retail activity; and higher property and land values. The overall effect has been a quantifiable increase in economic growth stemming from a reduction in road capacity and traffic levels. Evidence from the Transport 2000 pressure group backs this up, showing that reducing traffic levels in urban areas have a number of positive economic benefits including:

- increased footfall and therefore retail business;
- reduced pollution and congestion – resulting in lower commuting time and improved employee productivity due to lower levels of stress;

- reduced business costs as a result of productivity gains and fewer car parking costs.

However, it is important to distinguish displacement of activity from one area/group to another and net increase/decrease in activity. Proponents of traffic reduction measures state that cities that are first to implement traffic reduction measures will be the economic winners. This 'decoupling' of economic and traffic growth has been referred to as 'smart growth'. Suggested methods of achieving this are set out in Chapter 4.

4. Survey of views on key transport issues, potential solutions and research needed

4.1 Introduction

This section details the specific transport issues and problems that arose from consultation with practitioners, policy makers and academics. The consultations also generated some potential suggested recommendations for resolving some of these issues and to improve accessibility and reduce congestion. This section also outlines the research issues that consultees viewed as important to the Scottish economy, but felt were either not researched at all or under-researched given their potential importance. A large number of issues were raised during the desktop and the interview stages and this report has sought to identify the main ones.

However, there is a need to prioritise, otherwise they become simple a long 'wish list'. Any priorities will depend on individuals' or groups' interests and expertise. The main conclusion is that in many cases we know surprising little about the real links between transport and economic development, and much policy is supported by anecdote, ignoring displacement and expectations of links rather than firm evidence. Hence it is extremely difficult to properly compare schemes and to judge the opportunity cost of investments.

While reading somewhat like a wish list of research areas, the responses do indicate the diversity of issues requiring better economic and multi-disciplinary input into the policy process. As there are over 100 recommendations for further research, so have prioritised the main ones in the Chapter 5. Although many issues cut across categories,

for example congestion, we have grouped concerns into 15 main categories:

- The Nature of Linkages Between Transport and the Economy
- Intra-Scotland Freight and Business Traffic Issues
- External Strategic Links
- Travel-to-Work
- Social Inclusion
- Infrastructure Investment and Management
- Financing and Strategy
- Land Use and Planning
- Ownership and Regulation
- Peripherality and Rural Areas
- The Environment
- Policy Implementation
- Transport Appraisal: How do we Measure the Benefits?
- Transport Statistics
- The Overall Direction and Application of Research

4.2 The nature of linkages between transport and the economy

4.2.1 The issues

A number of consultees expressed a desire for further research into the effect of transportation upon economic development and vice versa. Although there have been studies conducted in the past to address this, it was still felt by many that the link between the two was not fully understood either in terms of its strength, or the mechanisms by which it took place. While many people argue strongly for the transport-economic development link, there is only limited evidence (directly relevant to Scotland) concerning the strength of such links and their specific forms in different circumstances. Yet to make policy decisions we need to know what the likely size and form of 'return' is for any investment.

4.2.2 Further research

There is a need to research and improve understanding on the following:

- The link between transport investment and economic activity at a macro level.
- The link between transport investment and economic activity for specific modes, e.g. can we use various forms of public transport to stimulate economic development?

The micro links (e.g. the effect of bus lanes on local economic activity) are arguably more widely understood, although not adequately researched.

- The extent to which prior economic growth causes a change in transport movement significantly different from current area or regional growth in income or output.
- the extent to which a prior transport change (e.g. infrastructure or traffic volume) may cause economic growth and affect its spatial distribution (and the implications of reducing urban sprawl upon transport and economic development);
- the extent to which transport investment can shift economic activity from buoyant to less buoyant areas, and what effect this would have on the wider Scottish economy (including the impact on overall employment);
- the appropriate level of transport budget in Scotland, and its mix between modes and functions;
- the prioritisation of specific transport projects that have an impact on the Scottish economy;
- the links between economic growth and freight movement;
- the issue of 'perception versus reality' – do roads really help to reduce congestion and boost the local economy?
- the role of risk and uncertainty in people's choice of transport (e.g. waiting at a bus stop may have a lower time value if there is real time information available on the timing of the bus; or the perceived uncertainty of using a potentially congested road or junction may disproportionately affect people's travel behaviour);
- specific links between transport investment and employment created, e.g. the effect of M74 investment in derelict land, the proposed Clyde Corridor light rail link. Does transport infrastructure stimulate economic development or could the £250m be better spent on direct job creation?
- the impact of past transport schemes (including revenue assistance as well as capital) and what are the present, and likely future, relationships between transport and

the Scottish economy?

- the link between public transport investment and property development/values.

4.3 Intra-Scotland freight and business traffic issues

4.3.1 The issues

Many consultees (academics and practitioners) highlighted the competition for road space between business and commuting/school traffic. This was felt to be a barrier to the efficiency of distribution operations. As mentioned earlier it was felt that it would be easier to induce a modal shift among commuters and the 'school run' than to remove business traffic from the road, although rail freight did provide some opportunity to do this, especially for long distance high volume goods transport. The key issues involving business traffic include:

- The completion of the trunk road network, most importantly the A8, A80, A8000 and M74. This is vital to ensure Scotland's competitiveness as company logistics are reliant on road transport. In particular:
 - the A80 improvements were needed to provide businesses in the north of Scotland with better access to markets in the central belt and England;
 - the A8 improvements are required as haulage businesses based along the M8 corridor need to be located in the centre of Scotland (e.g. due to driver time limits and accessibility) but suffer from inadequate road capacity;
 - the M74 northern extension was needed to ease congestion on the Kingston bridge, to provide access to markets for businesses in Renfrewshire, enhance the competitiveness of Glasgow airport (especially with Manchester), and to encourage economic growth in depressed areas of south east Glasgow.

There was consensus in general about the need for all the above links with the exception of the M74 extension, which some consultees believed would further depress southeast Glasgow and add to congestion along the M8.

- Development of sustainable distribution strategies for Scottish towns and cities, particularly in anticipation of a substantial growth in home deliveries.

- Integration of freight transport, in particular the technology needed to transfer between road and rail.
- Reduction of rail bottlenecks within central Scotland constrain rail freight potential, specifically:
 - rail line capacity has been reached in many routes in east central Scotland which limits the potential for freight growth, even though there is demand for expansion;
- conflict in line use between passenger and freight trains;
 - track limitations in places, e.g. weight restrictions on Forth and Tay Road bridges and capacity limits near Waverley Station, on the approaches to Glasgow Central and Queen St High Level Stations, at Partick and on the Glasgow-Paisley-Ayrshire and Glasgow-Kilmarnock-Dumfries-Gretna lines etc.
 - The reliability and comfort of the passenger rail network needs to be improved in order to take commuting traffic off the roads. The standard of trains and comfort falls far below many the rail systems in many EU countries, while the fares are comparatively high in Scotland.
 - There is a need to raise train capacity (e.g. by using longer trains) and improved frequency (notably in urban areas).
 - There is also a need for attractive multi-modal ticketing comparable to marginal costs of car use, particularly as the Central Scotland Transport Corridor Studies found busy roads often still had 85% of cars with only one occupant at peak periods.
- There may need to be increased park and ride provision and better connections to northeast Scotland. However, there are arguments against Park and Ride in some circumstances. The Central Scotland Transport Corridor Studies on the whole issues a warning about park and ride as it can actually worsen congestion on some roads while taking traffic from existing rail and bus services e.g. People drive closer in before shifting to park and ride.
- More consideration is needed of the implications of current forecasts and the methods of forecasting of the likely levels of sustainable corridor movement and modal share. In particular the aim in *Scotland's Transport:*

Delivering Improvements of striving to stabilise road traffic levels over the next 20 years, does not appear to be underpinned by research on whether this would damage or benefit the Scottish economy and sub-areas within Scotland. *Delivering Improvements* appears to suggest that there may be a need to relax targets for traffic reduction in Edinburgh while cutting back on local targets for traffic growth in Glasgow, but is this based upon robust research or the opinions or targets of business and government?

The above comments indicate that in general the limited capacity of both the road and rail network is constraining business traffic within Scotland and therefore acting as a barrier to economic growth, and that this lack of capacity is centred particularly around a few key bottlenecks in both cases. These comments need to be taken in the context of the potential of reducing business traffic while growing the economy, as highlighted in chapter 3. However, the consensus among business representatives was that the potential to achieve this was limited, at least in the short-medium term.

4.3.2 Further research

Research is required into:

- developing long run projections for growth in freight movements;
- information on Scottish freight origins and destinations. Information on flows is required in order to plan transport infrastructure;
- a detailed study of imports into Scotland, looking at where they come from, where they enter the country and how and where they are distributed;
- a wide-ranging survey of the impact of congestion on logistic operations across a wide range of companies and supplement this with direct observation and measurement.
- the potential to grow the economy without increasing freight movement;
- ways of 'decoupling' economic growth and transport usage;

- the opportunities to expand airfreight directly from Scotland. Currently most Scottish airfreight goes via Manchester airport. (A DLTR airport study is currently being conducted);
- The viability of short-sea (including coastal) shipping within Scotland.

4.4 External strategic links

4.4.1 The issues

In addition to the intra-Scotland business traffic issues highlighted above, there were a number of issues raised regarding Scotland's links with the rest of the world, particularly the main export markets in England and continental Europe. Comments focused on air, road and rail links.

Air links were seen to be important so as to ensure competitiveness of Scottish cities compared with European rivals, to export high value, low weight goods such as electronics, to create a strong image for cities and Scotland as a whole, for tourism (although they may also increase out-tourism) and because high value companies need to move senior staff internationally. Specific issues raised were:

- The changing cost and quality of international freight links and their effects on Scotland's relative peripherality. International air links have been shown to be important for inward investment and exporting, for passenger travel, including tourism, and high value freight.
- Connections from urban centres to airports – in particular the need for rail links to Glasgow and Edinburgh airports.
- The potential to improve air links to increase tourism in Scotland (air travel has had a net benefit on out-tourism to date).

Rail links were similarly seen as being important for commuting and to ensure that Scotland is not seen as marginal by inward investors, and to provide businesses with an alternative to road and air transport. This is particularly important given the bottlenecks in the motorway network around the M6 in the West Midlands and the A66 to Scotch Corner. Specific concerns highlighted were:

- The west coast main line in particular must have the capacity and capability to run high-speed freight from Scotland to the Channel Tunnel.
- There needs to be a rail interconnection from Scotland to the east coast UK ports.
- Rail bottlenecks, mainly in the south and midlands of England, currently hold up rail freight from Scotland.

Sea links also raised a number of issues regarding their strategic importance to Scotland:

- Investment in port infrastructure will have economic benefits in terms of employment, reducing reliance on English distribution hubs, and efficiency by encouraging modal shift from road transport.
- Because of the large 'lumpy' capital investment required, this will have to be funded at least in part from the state, as private investors will not fully finance these projects.
- The development of UK west and east coast 'marine motorways' could have benefits in terms of employment, avoiding motorway congestion and freeing up extra freight capacity.
- Following international trends, the development of a European offshore freight hub and free trade zone at Hunterston or Orkney would benefit Scotland in terms of hundreds of direct jobs and thousands of extra indirect jobs, possibly as part of a free trade port zone. As international freight traffic is growing year-on-year, this would create sustained employment growth.
- The new direct Super Fast Ferry from Rosyth to Zeebrugge offers potential benefits to Scotland, although its survival is not guaranteed.

Interestingly with all the modes discussed fast, reliable links with the rest of the world were seen as essential in both practical and image building terms. With the eastward expansion of the EU many consultees felt that Scotland was in danger of becoming increasingly relatively peripheral to the EU main economies and required good transport links to counteract this. Also this suggested that strong links to other international markets would remain extremely important.

4.4.2 Further Research

Research is required into:

- a strategic UK and European view of freight movements, and how Scotland fits into this (see below);
- a multi-modal study looking at freight transport links to and from Scotland. This would provide an overview of the role that different modes of transport can play in long distance freight movements within and to/from Scotland;
- quantitative studies of freight movements in and out of Scotland and of the impact of congestion on business logistics;
- the impact of direct air services (including direct links to continental hubs as compared to hubs in England) on the Scottish economy;
- reasons for the lack of direct international air links, including: a clear picture of current and future air usage; an assessment of viability of direct links; why these have failed in the past; the impact of the open skies policies; comparisons with countries such as the Irish Republic; and the impact of budget airlines;
- the feasibility and impacts of expanding international air links from Scotland;
- the need to consider the wider economic and social benefits of sea ports;
- joint evaluation of the impact of potential changes in external ferries, shipping and rail services on the Scottish economy (including a study of possible conflicts in obtaining rail passenger and rail freight 'paths' or 'track slots' on Anglo-Scottish and Channel Tunnel routes);
- the potential for facilitating the development of a shipping freight hub in Scotland, including how to attract private sector finance to develop infrastructure and ways to attract major shipping operators to such a terminus (to develop existing studies of Orkney and the Clyde);
- greater analysis of the potential for competition between fast rail and air;

- analysis of demand for different modes and the need to move from 'predict and provide' policies (e.g. as some argue is the case in the airports review).

4.5 Travel-to-Work

4.5.1 The issues

One area that was brought up frequently in interviews was that of commuting time and the ability of employers to acquire a suitable quality of workforce due to travel-to-work difficulties. The general consensus was that although the problem in Scotland has not yet reached the level of southeast England, unless measures are taken to reduce congestion then it might be an issue in the near future, certainly within the next 10-20 years. Specific concerns included the following:

- Businesses in certain areas, particularly out of town areas such as Edinburgh Park, are starting to experience recruitment difficulties, especially among lower paid workers, due to congestion, accessibility and parking problems. These areas may be too dispersed to make conventional public transport links economically viable. It was claimed that some standardised functions (such as salaries payment offices) were being transferred overseas due to lower costs and better availability of labour.
- The problems are more acute for lower paid workers, who are less likely to own a car and therefore find commuting to decentralised locations more problematic and for whom pay and conditions may be inadequate to compensate for the travel costs.
- Businesses reported fewer difficulties in city centre locations due to better public transport provision. Historically, locating in a Central Business District effectively increases the catchment area for a business. However, the relative accessibility has changed over time due to changing modes of transportation, location of residences and employers, etc.
- Businesses located in remote rural areas find it difficult to attract a workforce due to lack of public transport to enable commuting, and perceptions of isolation caused by inadequate infrastructure for longer distance travel. This is dealt with in more detail later.

- Lack of integration between modes of public transport, e.g. bus and rail services, particularly in out of town developments, creates an over reliance on cars and increases congestion.
- Bus travel has a low social image, but is often the most cost efficient method of providing public transport links. The image (and reality) of bus travel needs to be improved to induce a modal shift away from car use among commuters. In addition Bus Lanes (or “Greenways”) are needed to link the outskirts of cities to the centres and to avoid road bottlenecks (including the provision of new roads. This latter point may also help increase competition amongst public transport providers – see below).

Despite these concerns, a number of consultees put the problems in perspective, highlighting that:

- travel-to-work issues were not a major impediment to inward investors, who look at labour availability, wage costs and political stability etc. as primary concerns before transport;
- skill shortages, not travel problems, are currently the biggest cause of recruitment difficulties among businesses in Scotland.

Regarding the last comment, improvements to transport may bring wider catchments of skilled workers within reach of more employers, thus perhaps alleviating some perceived skill shortages.

4.5.2 Further research

Suggested areas for further research included:

- the effects of transportation on the labour force. How do labour mobility problems compare with skill shortages in constraining economic development, both indigenous and Foreign Direct Investment?
- the application of technology to developing public transport routing systems;
- developing road speed maps;
- further investigation of the precise effects of transport infrastructure investment on economic development and how the effects are split between redistribution and additionality;

- the relative effects of mobility and skill shortages in constraining labour supply for indigenous firms and inward investors;
- to what degree is, or could, the Central Belt of Scotland be a single labour market, and for what occupations etc.?
- how travel-to-work varies according to the characteristics of people, jobs and location, and the implications of this for social inclusion and economic development.

4.6 Social inclusion

4.6.1 The issues

There were also a number of concerns highlighted regarding transport and social inclusion, particularly concerning barriers to unemployed people finding work. All the points below were echoed by a number of academic and other specialists:

- People in rural areas are much more car dependant due to the lack of public transport infrastructure, making job search and employment even more difficult for those without access to a car.
- Within cities the increase in the number of workplaces situated in the suburbs or at the edge of conurbations presents problems for those without a car, especially as the number of orbital bus services is limited. Increasing these services would require intervention, as they are less economically viable than services to and from the CBD.
- The problem is less severe in smaller towns that tend to be more self-contained and less dependent on public transport.
- Part time workers, many of whom are female are particularly affected as their journeys are more difficult to co-ordinate and may involve early or late shift work when public transport provision is poor.
- Those with children are also particularly affected, especially as multi-purpose journeys (e.g. to childcare then work then shopping) are difficult with public transport;
- Linked to the above point, the poor quality of public transport links to any of the growth poles of employment in central Scotland, e.g. Livingston, East Kilbride and new developments at Gartcosh.

In addition to the issue of job accessibility for the unemployed or for low paid employees, another important inclusion issue raised was that public transport needs to take the special needs of the elderly into account. These people are an important part of the economy both in terms of domestic spending and as tourists. To ensure this is done, public transport needs to be:

- reliable, safe and clean;
- serve destinations used by the elderly (hospitals and doctors);
- run at times when older people travel;
- accessible to those who are frail.

There were a number of suggested solutions to the above travel-to-work problems. Those that arose most frequently included:

- The need to use city centre congestion charging, preferably intra-urban 'intelligent' road pricing. Interestingly, many business representative groups were in favour of this option. There are a number of issues concerning road pricing that need to be considered. There are possible adverse or positive spatial impacts, for instance, on city centre shops (so giving an impetus to out-of-town or suburban shopping), or on neighbouring regions (e.g. Fife may be affected by road pricing in Edinburgh). There is also a need to distinguish congestion charging from the separate policy issue and impact of trunk road charging.
- The need to build public transport hubs into existing business locations – this is expanded in the section on planning below.
- The formation of larger scale regional Passenger Transport Authorities stretching across the boundaries of more local authorities, and perhaps covering a Central Scotland Labour Market area. This issue is dealt with further in the section on Funding and Strategy.
- Encourage employment creation closer to residential areas, particularly near existing areas of high unemployment. i.e. take jobs to the people rather than expect people to commute to jobs, particularly with lower paid jobs. Also ensure adequate transport to allow people in these areas to access job opportunities elsewhere (e.g. the city centres and main suburban employment areas).

- Take measures to centralise populations and jobs in sustainable areas to build a critical mass where it becomes economical to provide public transport.

Again, the consensus on solutions to travel-to-work problems was high. It should also be noted that the last two, or possibly three points, are interrelated in that creation of employment and investment in public transport will itself encourage stability and/or in-migration of population to sustainable areas. However, in areas without a critical mass of population, such as depressed inner city areas, this may require investment in transport infrastructure in advance if it is inadequate. Similarly, regarding the second point, investment in public transport links in new business locations require public investment in advance before the development itself, to ensure firstly that it takes place at all, and secondly to influence travel plans of new employees.

4.6.2 Further research

Further research around social inclusion is needed into: the relationships between gender, age and race and spatial mobility and how it influences job opportunities; the effects of the cost of running a car on household expenditure, particularly for low-income households; driving and car use among older people; the use of public transport by older people; improving understanding of the link between social exclusion and transport.

4.7 Infrastructure investment and management

4.7.1 The issues

The majority of the people consulted believed that investment in, and the management of, transport infrastructure in Scotland was lagging behind the levels needed to sustain an acceptable level of movement and economic growth, and to improve accessibility and reduce congestion (although these issues are 'cross cutting' and are also discussed elsewhere). In particular it was noted that the per capita transport investment lagged behind that of the rest of the UK and even further behind the EU average, as highlighted in the report by Begg for the Commission for Integrated Transport (2001). However, different densities of population etc. that it is too simple to expect an exact correspondence of investment across regions and work on systematic 'standardising' transport expenditure may be useful.

Concern was expressed by a number of businesses and motoring representative groups that investment in public transport was crucial to take commuting traffic off the roads and thereby freeing up space for business traffic. However, this space might be filled by previously 'repressed' traffic unless there were other road management measures put in place (Central Scotland Transport Corridor Studies). This is a similar argument to the view that new roads 'generate' additional traffic, so negating much of their effect on increasing capacity. It was also argued, however, that commuting traffic was vital to the economy, an individual travelling to work *is* effectively business traffic, and may influence their productivity (and the ability of employers to attract suitable staff) even though they travel in their own time (this is at variance with the usual valuation of time in many appraisal models). Therefore it may be less clear that commuting is of little importance in economic terms although work-time travel is a direct cost to business. However, of the two types of traffic – business-to-business or travel-to-work – the overwhelming opinion was that commuting patterns would be easier to change.

Solutions suggested by interviewees included:

- The need for a 25% year-on-year increase in public transport expenditure to achieve this.
- Funding should come from existing tax on fuel as this outweighs current spending on infrastructure by around 7:1. However, the opportunity cost of this expenditure must be considered and also the full costs of transport (including, for example, accident costs) need to be considered to give a meaningful comparison. This could be a useful research project.
- Use the existing infrastructure more efficiently, for example, through the development of public transport mapping, IT based information systems and road speed maps to alleviate congestion and possibly congestion charging.

4.7.2 Further research

Research is needed into:

- the possible impact on the Scottish economy of changes in lorry charging and taxation (the subject of a current Treasury consultation) and the effects of recent changes in Vehicle Excise Duty and Petrol taxes for cars;

- impact of road pricing on city economies looking at the effects on competitiveness of the city economy and surrounding areas. This should include a sensitivity analysis of road pricing, and potential employment and retailing etc. displacement, possibly using Edinburgh as an example. Road pricing is also likely to be linked to other transport policy issues such as infrastructure and service provision and fare structures;
- expand studies examining options for the use of road pricing as a source of income to fund transport infrastructure;
- the handling of accident clearances on trunk roads: how delays can be minimised and how to cut road repair times;
- can the rail network cope with a modal shift to rail given the current levels of congestion on the rail network? For example, there are already limits on the track and signal capacity on the western approaches into Edinburgh;
- a survey to measure motorists' concerns to establish priorities for policy action;
- the economic impacts of road pricing and city centre congestion charging.

4.8 Financing and strategy

4.8.1 Issues

Other than the comments made by almost every consultee – that there is a need to commit more public expenditure to transport infrastructure – there were a number of specific issues raised:

- Scottish Executive spending on roads is disproportionately high compared with spending on other modes. In particular some interviewees argued that the opportunity cost of the M74 is very high.
- Linked to the above, there is a need to examine value for money in transport investment, and to have fair and transparent comparisons between modes.
- There is a public perception, perhaps unfounded, that Scottish roads are substandard, which diverts investment from other modes to roads.

- Many local authorities in Scotland (e.g. possibly Angus, Moray) are too small to deliver an integrated transport policy as they have limited resources and lack the critical mass of population necessary to make these schemes viable.
- Local authority transport budgets must compete against other areas such as education and social services. This means the share going to transport is limited and varies considerably between local authorities.
- Conflicts between local authorities can block or seriously delay transport investment (e.g. where a proposed road crosses boundaries, such as in Stirling-Clackmannan).
- The use of public money to finance transport infrastructure in selected areas is inequitable as only selected businesses in these areas see land values rise.
- The high cost of running a car was perceived by some consultees to be holding back economic growth, as this is now the largest item of household expenditure, particularly in rural areas. However, the cost of operating a car has fallen in the long-term, so it would be useful to research such costs between different parts of Scotland and over time.
- There is concern that extra expenditure on transport may be subject to producer capture, whereby suppliers, and/or their workforces, capture a proportion of extra subsidies for their own benefit, in terms of higher profits or wages, especially where the supplier has a degree of monopoly power.

Solutions that were suggested by interviewees included:

- Reallocate some funding from road building programmes into public transport.
- Increase investment in light rail, as in Leeds, Manchester and Bristol or in the EU.
- A mechanism to overcome obstacles to strategic transport decision-making, particularly conflict between local authorities. The Scottish Executive cannot take responsibility for all roads.
- A tax on private land values which would channel money made by private businesses from infrastructure invest-

ment back into the public domain. Some of this could then be used to fund infrastructure in other areas. This perhaps has echoes of the 'Betterment' taxes of the 1940s.

- Lowering the cost of running a car by reducing the price of fuel and tax would divert consumer spending back into the economy. However, the cost of motoring per car (but not per household, given the rise in per capita car ownership) has apparently fallen in the long-term.
- A detailed public analysis of the real costs of Public Finance Initiative/ Public Private Partnership projects (such as the Skye Bridge or M74 upgrading) should be made. Once the contract for a PFI/PPP (Private Finance Initiatives or now termed Public Private Partnerships) was let the commercial details of the contract should be in the public domain so that decision makers and others should be able to clearly identify the actual costs and benefits of the scheme. After letting the contract confidentiality should not be used to hide information, as the contract has been won and it is in the public interest for other potential PFI schemes to see the full details of existing public contracts. In addition there is a danger of 'moral hazard' if the government 'bails out' any PFI/PPPs (e.g. in terms of altering the contracts to the benefit of the private service provider or under writing any losses etc.). Further there is the issue of potential lack of competitiveness if the scheme has only one preferred bidder at a later stage.

4.8.2 Further research

Further research should include policy on structures and funding (both total justifiable funding for transport and its distribution). Research is required in to each of the potential solutions set out above (and so are not repeated here).

4.9 Land use and planning

4.9.1 The issues

The principal issue concerning land use and planning appears to be a demand from businesses to locate in decentralised out-of-town developments, away from residential areas, partly to avoid congestion and high property costs. However, this decentralisation leads to increased car use, which in turn creates its own congestion problem (which is seen in an extreme form in many

parts of the USA, where suburban and edge-city congestion has become significant). Specific issues included:

- Developers want to locate in decentralised areas such as Edinburgh Park, even though they recognise the problems of lack of public transport and congestion.
- Congestion in urban areas and main routes leads to unpredictable travel times and costs, which creates problems for businesses operating Just-In-Time delivery and stock systems. This may push these companies out of town into dispersed developments, creating further problems (or opportunities) for areas neighbouring cities.
- The fragmentation of transport and land use planning, where developers and transport operators operate independently. As a result Public transport is rarely adequately integrated into new developments.
- Local authorities need to have more control over the transport and land use planning process to ensure the above and further research into the effects of NPPG17 on Transport Planning would be useful.
- There should be useful lessons from the current interesting research being carried out on highlighting the need for transport/land use links in city region plans by the Scottish Executive and there is the ongoing Cities Review and Review of Strategic Planning, and the Edinburgh Local Economic Impact Model and Land Use/Transport Interaction model.

Suggested solutions included:

- What are the drivers of different types of businesses and residential location and how these affect demand for travel and the potential for planning policy to reduce it?
- Ways in which transport and land use planners can co-ordinate their operations to ensure public transport provisions in new developments and influence business location.
- The need to channel development into modal points better served by public transport.

- Development of mixed-use central nodes (CBD and satellite centres) rather than motorway corridors. Stockholm is seen as a good example city of this.
- Ensure that new business developments incorporate new transport hubs. Copenhagen is cited as a good example of this.
- Ensure that employment is created close to centres of population to cut down on the need for travel.

4.9.2 Further research

Feedback from consultees, and the views of delegates at the STSG seminar revealed this to be a very important issue in need of further research. Issues of land use and planning lie further up the decision chain than some other issues discussed. For example business location affects congestion and dictates accessibility for potential employees and access to markets. The need for further research in this area therefore focuses on the 'drivers' of transport demand. Specific research requirements were:

- what influences the location choice of people and different types of businesses;
- the effect of the housing market, particularly the supply of housing, on travel decisions;
- the potential for 'retro-fitting' dispersed business and retail parks with public transport provision and reduced car parking;
- the extent to which policy should support sustainable land use patterns and the links of these with traffic reduction – this may involve higher density, brownfield development around central nodes.

4.10 Ownership and regulation

4.10.1 The issues

An important issue that has been the subject of relatively little research is the ownership of transport infrastructure and operations in Scotland. There has been considerable change over the last 20 years, with successive privatisation and deregulation of bus, rail and air transport. Particular concerns are:

- Deregulation of bus services has not been totally successful. There has been a significant fall in the number of bus passengers since deregulation. However, Scotland now has two major international bus companies. Problems include:
 - an unstable network in terms of routes and prices, making location decisions difficult for people and businesses;
 - 'cherry picking' favourable routes and cuts in marginal and weekend services, which goes against the trend for flexible working;
 - lack of through and cross-modal ticketing;
 - reluctance to invest in new services (although with a number of notable exceptions);
 - bus wars have dented the image of buses;
 - administrative inefficiencies inherent in the tendering process.
- The present regulatory system is fragmented. The Scottish Executive has little control over bus operations (although it may consider modifying present bus aid – such as the Fuel Duty Rebate – in line with STAG objectives). Rail infrastructure comes under regulation by the SRA and ORR based in London, but rail passenger franchising costs within Scotland are now an Executive responsibility and the Executive has powers over the construction of new railways. It is possible that 75% or more of the costs of rail infrastructure enhancement in Scotland will be met from sources other than the SRA – including direct Scottish Executive contributions and Private Public Partnerships. In addition it may be sensible on some occasions to compare infrastructure investment across modes, for instance the cost of a new build dedicated bus/public transport vehicle road lane in cities may be more effective in the long term than some rail initiatives, and might add competition between modes and operators.
- There is a need to analyse the structure and impacts of the new bus concessions for older people (especially older workers) and also to consider whether the scheme should be modified and also the opportunity costs of expensive fares for young people in many areas (especially as young people need access to training and are usually in low paid jobs).
- The fragmentation of the rail industry makes it complex and difficult to provide investment, e.g. Railtrack (or the successor body) must agree to build the station and Scotrail to run the trains.
- There has been a significant strengthening of 'low cost' airlines (and responses to them by other airlines). The greater use of main airports by low cost airlines (in addition to the more remote smaller airports used by Ryan air) and the lowering of fares by main airlines should make air travel cheaper for business travel (if they continue in the longer term). Improved links to international hubs (including links to growing European hubs such as Stansted) should also significantly affect the (two-way) accessibility of Scotland in time, ease of travel and financial cost terms. There are similar two-directional benefits for tourism. The growth of low fare airlines has had a positive effect on passenger numbers and employment – at least in the short run. However, consolidation of airlines, especially post-September 11 (although starting before then) could create greater 'monopoly' power and could lead to a reduction in services and increased fares (for instance: although there is still competition, the take-over of Go by EasyJet was followed quickly by cutting Go flights between Scotland and Belfast).
- There may be a problem with the ownership and level of 'monopoly' power of main airports by BAA (especially Glasgow and Edinburgh), resulting, for example, with potential incentives to support travel via other BAA airports such as Heathrow. Similarly in the Highlands there have been reported disputes between airlines and Inverness airport, with claims that lower landing fees could lead to better services to Inverness and on to smaller airports.
- As mentioned, it is notable that there is a high degree of monopoly (or duopoly) power in the provision of infrastructure and/or services in many cases (e.g. Ports, airports, buses, passenger rail and rail freight). It is interesting that the main owner of ports on the Forth were permitted to take an interest in Rosyth port, so preventing possible greater competition. Similarly during privatisation of the airports the government gave a considerable monopoly power to BAA in Central Scotland as they now own the two busiest and most accessible airports. At a smaller scale there is a debate concerning the monopoly power of Western ferry service to Dunoon if the EU prevents subsidies to the Caledonia MacBrayne passenger and car ferry if it takes cars. Analysis of the

impacts of such government decisions and the resulting lower competition would be useful.

- A key issue is how best to use the restricted public funds in applying transport policies meeting economic and social objectives.
- There have been substantial problems in delivering relatively modest rail improvements in Scotland e.g. platform lengthening, extra rolling stock, extra passing loops, Larkhall reopening, Stirling-Alloa-Longannet reopening – and Light Rail projects.

Suggested solutions centred mainly around the need to re-regulate transport operations:

- ‘Quality Contracts/Partnerships’ or franchising, where a local authority or Regional Transport Authority partnership (SESTRANS, WESTRANS, SPT) invites one bus company to operate each route, subject to a set of service conditions. Current examples of this are found in London and the Netherlands.
- An independent transport regulator to give incentives to bus operators to build up the market.
- The Central Scotland Transport Corridor Study suggests a strong case for bus re-regulation (using a franchising approach) as part of delivery of economic and social objectives, although there is currently no government policy to do this.
- Some argue that there needs to be a single body in charge of both rail infrastructure and train services, i.e. a vertically and horizontally integrated body, although others counter this. In any case there would need to continue to be the safeguard of appeal to the ORR in the case of disputed track slot allocations.
- The need for Scottish control of railway infrastructure (rather than Strategic Rail Authority control).
- A common suggestion regarding the above was that Scotrail and the responsibilities of the SRA in Scotland should be under the control of the Scottish Executive, to encourage parity of funding with the road network.
- Vertical rail integration was not popular among all consultees – some felt it could lead to a private monopoly

situation where the infrastructure owner would discriminate against other operators.

- An alternative to vertical integration of rail was a national (UK) body to succeed Railtrack, combined with an independent regulator.
- In the long run some consultees felt that public transport needed to be brought back into public ownership, as it will always require subsidisation.
- There are opportunities to encourage greater competition between rail and buses by providing better bus routes using ‘Greenways’ (and other methods such as traffic light prioritisation), both in town, from the edge of town, and at bottlenecks. Buses are particularly appropriate for low-density areas and are more likely to serve smaller communities.

An overriding theme behind the issues raised was that it was not privatisation *per se* that was a hindrance to efficient transport, but deregulation. Many interviewees would be happy to continue with bus and rail services provided by private operators, but with stricter regulations regarding routes and fare structures.

4.10.2 Further research

Further research is needed on the consequences of (and potential remedies for) the high degree of monopoly power throughout much of the transport in Scotland, particularly the privatisation of former public bodies into private companies with considerable degree of monopoly power different geographic and functional area (for example the main airports owned by BAA; ports controlled or partly controlled by the former Port Authorities, including restricting potential competition through part ownership; railways; and the degree of monopoly power of different bus companies in different areas); and also the costs and benefits of integration between operators (of the same or different modes, e.g. between bus companies in a city) compared to competition.

4.11 Peripherality and rural areas

4.11.1 The issues

Many of the issues already discussed under the other headings also apply to rural areas and areas peripheral to the centres of economic activity in Scotland. However, it

is useful to isolate a few key issues that apply specifically to these areas:

- The overall cost of using transport in rural areas is greater than in other areas and infrequent rail and ferry services are a cost to business.
- Petrol prices in particular can be 15p per litre higher in remote rural areas. This has a knock-on effect of pushing up rents, wages and property prices and can threaten the viability of business and limit the travel-to-work of the low paid. This particularly problematic as rural areas are very dependent on car transport. Research would be useful into the effects of lower petrol and diesel prices.
- Industry in peripheral areas is more vulnerable to increases in transport costs because of the distance travelled.
- The poor quality road network in northern and western Scotland increases travel time.
- Rail access is important for some freight movements, although generally road trips are faster.
- Congestion as a measure of road quality is not appropriate for rural areas. Accessibility would be a better measure.
- There may be a bias in appraisal methods for transport investment, against low traffic volume areas outwith the Central Belt.
- Rural areas do not have control over their own transport affairs and rural transport is not a priority for national (UK or Scottish) transport policy makers (although the UK national policy process does explicitly take account of impacts on rural areas).
- Infrequent and expensive air transport to the Highlands and Islands makes it difficult to get off islands at the weekend. This can make it difficult for businesses to find a labour supply as people recruited externally often want to leave at weekends, and restricts the number of tourists.
- The continuation of public financial support for Caledonian MacBrayne west coast ferry services is essential as these services are an economic lifeline to remote

areas. Consideration needs to be given to the implications of European Commission policies upon ferry provision and support.

- There is a monopoly in ferry services and airports and relative lack of competition in the haulage sector. This can result in higher prices and makes businesses, and remote areas in general, less competitive. Research would be useful to determine the costs and implications of these.
- There is a need to distinguish remote rural areas from those that are peri-urban (with easy access to urban areas).
- There is a need for greater information on travel-to-work and job seeking (and alternatives such as using ICT) in rural areas.
- There is a need for better co-ordination of the variously publicly funded transport services in rural area, such as those provided by education and social services, the health service, subsidised bus services etc. This could reduce costs and/or improve service quality at little or no significant extra cost.
- There is scope for increased use of Demand Responsive Transport (e.g. new projects in Angus and Highlands), linked to strategic public transport routes. This could be useful in travel-to-work terms as well as wider access to services etc.
- Greater monitoring and evaluation of rural transport grants and other support would be useful.

Possible solutions identified by some interviewees included:

- control of fuel tax should be at local level;
- putting ferry services to the islands out to tender;
- keeping airports in the Highlands and Islands in public ownership, but contracting out airport management;
- Road quality evaluation using accessibility and travel time rather than congestion. This is dealt with in more detail in section 6.3 below.

4.11.2 Further research

As so much of Scotland is made up of peripheral rural communities, this requires specific research into the

transport issues faced by rural economies and communities. Research is required into:

- the impacts of congestion and peripherality on economic growth within Scotland (one of the most congested areas, Edinburgh, has the best economic record yet, overall, the Highlands & Islands have had higher population and income growth than the rest of Scotland since 1960);
- the links between job search and travel-to-work in rural communities;
- the effect of new road building on peripheral areas, e.g. M74 on business in Helensburgh, the Aberdeen bypass on business in Peterhead and the northeast;
- the impact of possible changes in air and ferry services and charging structures on economic and social objectives for the Highlands and Islands;
- the viability of substituting air for some longer-haul ferry services in the Highlands;
- pilot studies to reduce western and northern isles ferry fares and increase the frequency of services;
- the feasibility of replacing road freight with sea and air services;
- Ways to co-ordinate the full range of transport providers to provide more efficient and effective services and to investigate new types of services (such as demand responsive transport);
- the unintended impacts of legislation on different forms of transport (such as free bus travel for the over 60s, potentially damaging community transport schemes);
- the impacts of changes in ownership and operation of public transport services on fragile rural communities and the scope for better co-ordinate amongst publicly funded operators (including the Health Service).

4.12 The environment

4.12.1 The issues

Many of the issues raised concerning transport and the environment, such as:

- ‘decoupling’ the links between traffic and economic growth;
- the need to reduce traffic congestion;
- encouraging modal shift away from road transport;
- cutting down on unnecessary journeys through planning policy;
- the link between global environmental changes (e.g. global warming and the potential higher transport costs, possibly higher rainfall, rising sea levels and higher winds) and the implications for Scottish transport and the economy (as well as wider influences of course).

Discussion of these in a purely environmental context would involve repetition of what has already been highlighted above. We have chosen not to do this, however, there were some issues raised specifically with the environment in mind that have not been fully mentioned so far:

- Continued development of vehicle technology, e.g. fuel cell technology to cut pollution. This would also give an added boost to research and development and possible industry development.
- Increasing the environmental attractiveness of an area through traffic removal can *stimulate* economic growth, as it becomes more attractive to residents and business.
- Opportunities for renewable energy and energy conservation and the implication for employment and research and development.
- The development of a north European deep water shipping hub in Scotland would reduce the need for harmful dredging in the Netherlands, Belgium and Germany, and would reduce unnecessary empty ship journeys.
- Investment in increased UK shipping and ‘marine motorways’ would encourage a modal shift away from road freight transport.

4.12.2 Further research

Again, all of the issues highlighted above as having environmental impacts would benefit from further

research as described in the relevant sections of this report.

4.13 Policy implementation

4.13.1 The issues

A number of consultees expressed concern that the way in which policy was implemented was as important as the decision as to the policy content. There were a number of constraints that were seen to be holding back the implementation of transport policy, in particular communication between transport and other planners, and between different local authorities.

4.13.2 Further research

Regarding the ways in which transport policy is implemented, further research is required into:

- The need for greater communication by those responsible for land use planning, economic development and improved strategic co-ordinate to ensure that new industrial or economic developments are built with access to existing public transport and rail links.
- The viability of regional transport bodies, considering how they could be formed, the practicalities of running them and the implications on transport provision.
- How local authorities negotiate local transport strategies – as it is argued that many are locked into the old road building agenda.
- The extent to which present institutional, administrative and financing arrangements (including the balance of research funding) are ensuring ‘best value’ in relation to transport policy objectives, including the balance economic, environmental, safety and social factors.
- The effectiveness of government documents in influencing local transport policy, e.g. how the White Paper is viewed by decision makers such as local councillors.
- The case for and against more centralisation of control of Scottish transport in the Scottish Executive and the Scottish Parliament.
- The feasibility of reinstating of the National Transport Forum in Scotland.

4.14 Transport appraisal: how do we measure the benefits?

4.14.1 Introduction

There has been considerable work carried out by economists in Scottish Universities in areas such as cost-benefit analysis and appraisal. However, more is needed on how these should be modified for transport projects. In addition, consideration needs to be given to guidance for government decisions on how best to distribute any given level of public support between capital projects and revenue support, given the relevant Scottish Executive policy criteria and the evidence on transport and economic development considered in this report and elsewhere. Analysis is required to consider whether the effect of EU state-aid rules, UK rules and definitions of public borrowing (including very limited borrowing powers of Scottish Parliament) could create excessive tensions and sub-optimal value in public private partnerships and in the regulatory/competitive framework.

4.14.2 The STAG report

The Scottish Transport Appraisal Guidance document (STAG, 2001) sets out guidelines for the economic appraisal of a transport investment. It is recommended that appraisal be split into two broad streams: Transport Economic Efficiency (TEE), to examine the direct impacts on operators and users of transport; and Economic Activity and Location Impacts (EALIs) that measure the economic impacts (both positive and negative) on the local area and Scotland as a whole expressed in terms of GDP and employment. In other words TEE measures the direct economic impact of an investment on transport activity and EALIs attempt to quantify the wider economic benefit to all sectors of the economy.

A key recommendation is that TEE and EALIs must be calculated separately, as while they may overlap, TEE analysis alone will often not reveal the true extent of economic impact to be offset against project costs. They also discuss the situation where there may be positive (or negative) impacts but also redistribution implications. STAG therefore suggests that it is necessary to look beyond the immediate impacts on traffic and transport into the wider economy in a variety of sectors, when considering economic impacts. However, research is still required on:

- how STAG is to be operationalised in different contexts (e.g. different forms of infrastructure or transport management, or different types of location).

4.14.3 The OECD report

The report by the Organisation for Economic Co-operation and Development into the impact of transport infrastructure investment on regional development (OECD, 2002) highlights a number of issues regarding the appraisal of investment schemes. After reviewing a number of literature sources on the subject the report concludes that the impacts of transport investment and how to measure them are still not clear. It commented that there is a definite lack of information from *ex-post* studies that provides a firm, quantitative link between transport and regional economic development (see also SACTRA, 1999, above). It concludes that there was a need for further research into understanding the processes by which transport investments produce positive impacts, and the level of these impacts. Identifying these processes will allow replication of these benefits from future investments.

In particular the report highlights the problem that traditional cost-benefit approaches to appraisal measure only the direct user benefits such as travel time and cost, while ignoring the wider socio-economic impacts. These benefits might include increased accessibility, employment, business efficiency, social inclusion and environmental improvements, and should also take into account wider transport-related benefits not covered by traditional cost-benefit analysis such as inducing cross-modal demand and improved reliability and quality of transport. The report stresses the need to examine these wider impacts *in addition* to cost-benefit analysis in a complementary approach.

Another issue raised is the problem of comparing different *ex-post* studies, as they may be based on observation areas with very different characteristics, making direct comparison difficult. The report stresses the need for *ex-post* studies to clearly define the region in which the study is based.

The report also highlights the need for careful selection of evaluation criteria for *ex-post* studies. It argues that for investment appraisal reports to be most effective and useful they must take into account the regional context

and the specific economic development needs of the region and evaluate transport investment projects against these broad strategic objectives. However, it is important that the regional characteristics are identified in sufficient detail to give a meaningful context for investment, as broad aggregate data may be inadequate.

4.14.4 Distribution issues

Hine and Mitchell (2001a) use a case study approach examining personal accounts of individuals' travel experiences, concluding that transport policy often fails to include the needs of all individuals. There are significant problems common across different groups of society: physical, temporal, economic, spatial and psychological and that transport policy appraisal should incorporate these social factors in cost-benefit analysis.

4.14.5 Further research

In general, it was accepted that it is vital to fully analyse potential transport infrastructure developments to ensure that they bring genuine economic benefits. A common criticism was that the most common methods of appraisal used, particularly measures of congestion do not accurately reflect the net economic benefits of a project. Specific suggestions have been split into those dealing with appraisal mechanisms, i.e. *how* projects should be evaluated, and appraisal areas, i.e. *what* should be evaluated.

In general, further research is needed into:

- improving our understanding of the processes by which transport investments produce positive impacts, and the level of these impacts. Identifying these processes will allow replication of these benefits from future investments and the extension of traditional cost-benefit analysis to take more fully into account factors such as inducing cross-modal demand and improved reliability and quality of transport and whether STAG should be modified;
- an improvement in the independent evaluation, and dissemination, of past policies, including, for example, freight facility grants (how much traffic did they actually remove) or the concessionary fare scheme for pensions due to be implemented later this year.

- a consistent framework and an increase in the number of ex-post studies of transport infrastructure and schemes, so as to aid future policy decision.

Additionally, issues raised regarding the *areas* that should be evaluated are given below:

- develop an even base for comparing road, shipping, air and rail schemes in relation to 'best value';
- examine whether current institutional, administrative and finance arrangements (including research funding) are providing best value in terms of a wide range of policy objectives, i.e. economic, environmental, social and safety factors;
- overcome the lack of *ex post* evaluation. There is a requirement to develop systematic monitoring of past policies and project impacts (including assessments of what might have happened anyway – conclusions on net jobs impact);
- quantify the external benefits of rail, such as reduction of pollution, congestion and noise, for use in economic assessments. This should be regularly updated. These factors are not easy to quantify, but are too important to disregard on grounds of simplicity;
- quantify externality costs of road transport freight and assess viability of substituting with rail freight. E.g. road degradation by HGVs is not currently fully costed. This is a problem as many roads are unsuitable for HGVs;
- consider how to operationalise the STAG proposals in different contexts (e.g. different forms of infrastructure or transport management, or different types of location);
- the need to supplement theoretical links with evidence from *ex-post* empirical studies;
- incorporate negative externalities of all types of transport spending. Potential problems may include:
 - environmental damage;
 - loss of attractiveness to tourists;
- decreased accessibility (e.g. communities may be cut off by a bypass);
 - displacement of existing jobs from other areas;

- exposure to competition from other areas (e.g. upgrading the A1 may result in a concentration of employment moving to Newcastle to serve eastern Scotland and the north of England).

Suggestions for research into the *mechanisms* by which value can be measured included the following:

- the need for appraisal methods to investigate alternative measures such as accessibility, as measures of congestion do not accurately reflect the net economic benefits of a project. This has been largely addressed in the STAG report, but how it will be implemented in detail remains a concern for policy makers. In particular:
 - it was felt that current time-saving based measures are biased against multi-modal investment;
 - there is a need to consider the impact of transport plans on economic development, not on specific indicators such as congestion and traffic levels that may or may not have an economic impact;
 - current road building schemes which use congestion reduction as a measure biases against remote rural areas where required improvements are to improve the journey time by widening and straightening roads irrespective of the number of vehicles;
- apply utility analysis to define a weighting system for priorities;
- examine the opportunity cost of transport policies to decide if funds could be put to better use. For example disabled facilities on trains – would it be more cost effective to subsidise the conversion of taxis instead?
- the need for more *ex-post* evaluations of the wider socio-economic impacts of transport investment;
- evaluating transport investment in terms of a wide range of policy objectives, i.e. economic, environmental, social and safety factors to reflect broader policy objectives.

4.15 Transport statistics

4.15.1 The issues

Concern was raised by some academics and practitioners that full use was not being made of current statistics and also that there were a number of key statistics not currently collected that would be useful in the formulation of transport policy.

4.15.2 Further research

Consultees suggested that further research is needed on the following:

- The main trends in transport and on in-depth analysis of existing data. For instance longer distance and rural traffic in Scotland appears not to be rising, but at the same time conurbation traffic (and associated congestion) is increasing rapidly. There are large amounts of data available, primarily through the Scottish Executive, whose analysis would greatly enhance our understanding of traffic flows and changes.
- The production of accurate data on Scottish Executive spending on transport in a way that can be compared with DTLR figures;
- The modal share of road vehicle miles measured by passenger kms and tonne kms, which should be published on a quarterly basis.
- Making fuller use of available information and refining information collection to give added value (could mean cuts in some information already collected but expansion of other aspects).

4.16 The overall direction and application of research

4.16.1 The issues

After concentrating on specific issues it is important to mention that some consultees commented on the way that research should be carried out in addition to what should be researched. Interviews with academics largely supported the findings by OECD (2002): there is a need to supplement theoretical links with evidence from *ex-post* empirical studies; there is a need for more *ex-post*

evaluations of the wider socio-economic impacts of transport investment; and a requirement for more multi-modal studies on the impacts of investment.

4.16.2 Further research

The most important specific themes arising were the need for:

- greater consideration of the timescales and resources used in transport planning. There is a need for more reports examining short term actionable improvements rather than longer term reports that may not see implementation;
- a shift in the balance of research from technical or project-specific issues towards strategic and policy-related issues – including a focus on strategic delivery within next five years;
- research that reflects the unique ‘Scottish dimension’ of economic, social and geographic characteristics;
- analysis of the accepted current issues and apply lessons learned in local studies on a national basis. For example, the findings of the Inverness road impact study (around 1997) could be applied to Scotland on a wider scale;
- some research carried out by consortia of academics, consultants and practitioners rather than individual organisations;
- knowledge of public expectations of transport needs – and relate this to what is deliverable in the Scottish Executive Budget;
- a general shift of focus towards research aiding best value within restricted funding and partly conflicting economic and social policy objectives (including actual linkages between transport and the economy over next 20 years);
- a sharper distinction between 5-year delivery and study of longer-term options;
- it is important that transport data series are not cut (e.g. Caledonia MacBrayne no longer apparently producing quarterly figures due to their possible use by potential

competitors). In cases such as this the contracts and subsidy conditions should insist on public disclosure of data need for public planning and analysis.

A few consultees, both academic and practitioners, commented that no further research was needed – there is too much research already and not enough action! Examples given were that the need for M74 and Heathrow Terminal 5 was widely accepted so why conduct further expensive research? Glasgow to Edinburgh rail electrification studies have been carried out, but there is still no action to date.

In conclusion, each of the transport issues in this chapter, and the potential of these and other solutions, would benefit from independent rigorous research. In each case there is considerable scope for international, or indeed UK, comparative analysis.

5 Conclusions and priorities

5.1 Introduction

The main conclusion is that in many cases we know surprising little about the real links between transport and economic development, and much policy is supported by anecdote, ignoring displacement, and expectations of links rather than firm evidence. Hence it is extremely difficult to properly compare schemes and to judge the opportunity cost of investments.

A large number of issues were raised during the desktop and the interview stages of this research. This report has sought to identify the main ones. However, there is a need to prioritise, otherwise they become simply a long ‘wish’ list. Any priorities will depend on individual’s or group’s interests and expertise. However, a brief list of a few key areas of research is discussed below. This does not mean that the many dozens of issues raised earlier in the report are unimportant, rather that this list sets out important policy issues where research economists may currently be able to offer useful insights. It therefore does not seek to identify key research areas in transport in general, as many other disciplines have much to contribute, often working with economists.

The areas are:

- Congestion
- Links between transport and economic development
- Travel-to-work
- Regulation and Ownership

5.2 Congestion

Policy implications:

One major current policy area to which economists can contribute, with other disciplines, is that of congestion. Congestion is a cross cutting theme that affects many of the issues discussed in previous sections. It reduces accessibility in terms of increasing travel times and risk and uncertainty associated with journeys. While it is a considerable problem for individuals and businesses in the conurbations, congestion is still low compared in many other parts of the UK (especially the southeast). While congestion reduces business efficiency and more generally welfare and environmental standards, it is difficult to say to what degree it is actually holding back development (rather than is perceived to hold back development). It may influence access to labour markets to some extent, but again, commuting times are longer elsewhere and labour shortages would only to limited extent be overcome by reduced congestion. Better training, in-migration etc., as well as transport links in general, are perhaps more important to increasing the labour pool.

Congestion does have an important impact at the more local level. Better public transport and reduced congestion would undoubtedly improve the quality of life and general well-being of people, as well as making city centre locations more attractive to firms. Given the greater accessibility of city or population centres for those without cars, this is important in social inclusion terms also. Finally, given the relatively low car ownership in Scotland, it is likely that congestion may increase (albeit less so if there is a recession) so relevant policies are required. Anti-congestion policies are an important area for research.

Key research issues:

- The real and perceived effects of congestion on the economy.
- The costs and benefits of anti-congestion policies, such road pricing in Edinburgh, on local economies and their neighbours local economies.

5.3 Links between transport and economic development

Policy implications:

There is a need to supplement theoretical links with evidence from *ex-post* empirical studies which evaluate the wider socio-economic impacts of transport investment; and a requirement for more multi-modal studies on the impacts of investment. This will help decision makers in identifying global budget allocations and choosing specific transport schemes.

Key research issues:

- *Ex-post* empirical studies and evaluations of the wider socio-economic impacts of transport investment and linking these to theory.
- Further investigation of the precise effects of transport infrastructure investment on economic development, how the effects are split between redistribution and additionality and how it affects employer and individual location and behaviour.
- Greater independent *ex-post* evaluation of past initiatives and projects.
- Analysing the case for transport spending relative to other sectors and overall Scottish Executive objectives.

5.4 Travel-to-work

Policy implications:

Travel-to-work is an important policy issue for a number of reasons. It is strongly linked to congestion, it affects employers' ability to attract and keep staff and it affects social inclusion, all issues that are high on the political agenda. Increases in congestion are likely to make travel-to-work more difficult, yet labour market differences across Scotland mean that improving travel-to-work can service equity and efficiency objectives in the economy.

Key research issues:

- The relative effects of mobility and skill shortages in constraining labour supply for indigenous employers and inward investors.

- How travel-to-work varies according to the characteristics of people, jobs and location, and the implications of this for social inclusion and economic development.

5.5 Regulation and ownership

Policy implications:

As discussed earlier, much of the provision of transport infrastructure and services has a relatively high level of 'monopoly power'. Hence the regulation of this is crucial. Policy issues focus around forms of regulation, ways of increasing competition where appropriate, and where should regulation power best be situated within the UK framework. As the process and experience of devolution develops, such issues are likely to become more important.

Key research issues:

Further research is needed on the consequences of (and potential remedies for) the high degree of monopoly power throughout much of the transport in Scotland; and into the effects of devolution on regulation.

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Endnotes

1. Includes reconstruction, new road surfaces, maintenance of bridges and other road structures.
2. From 2001-02 Roads improvements & Structural Maintenance have been reclassified as current expenditure. Expenditure on structured maintenance" now appears under the "current" heading for earlier years, but it is not possible to separate "improvements" from "new construction" in the capital figures for 2000-01 and earlier years.
3. Includes minor repairs.

4. Capital payments made by Local Authorities in the financial years shown (i.e. cash basis).
5. From 1992-93 includes expenditure on Toll Bridges, Bridge strengthening (excluding toll bridges), Bridge repairs (excluding toll bridges), Structural maintenance of roads, Bypasses, Road safety-local roads, Bus priority measures, Forest roads, New roads and Improvements and reconstruction (>£2million), and Other road projects (< £2million).
6. Includes investment in Shipping, Transport piers and ferry terminals, Glasgow underground, Public transport - rail, Other public transport (excluding bus priority measures).
7. Includes subsidies for the Community Transport Association, freight facilities, shipping, piers, harbours and road safety.
8. The revenue account figures are reported on an accruals basis (i.e.reflected in the accounts of the period in which they take place).
9. Includes rate/general fund contributions to the current expenditure of LA and non-LA transport undertakings, and revenue contributions to capital.
10. 1999-2000 revenue net expenditure data are provisional.
11. The figure differs significantly to those for other years due to the different reporting of a grant in aid of expenditure on rail passenger services in the Strathclyde Passenger Transport area.
12. Prior to 1996-97 School Crossing Patrols were recorded on Local Financial Return (LFR 4) Law, Order and Protective Services.

Appendix 1: List of Consultees

We would like to thank the following transport policy actors for their input to this study.

Bob	Armstrong	Freight Transport Association
Peter	Conlong	Scottish Executive
Fergus	Cooper	Glasgow City Council
Ian	Duff	Scottish Council on Development and Industry
Matthew	Farrow	CBI Scotland
Carol	Gilbert	Scottish Airports
Neil	Greig	The AA Scotland
Derek	Halden	Derek Halden Consultancy
Tom	Hart	Scottish Transport Studies Group
Brian	Hay	Visit Scotland
Donna	Heaney	Scottish Consumer Council
Colin	Howden	TRANSform Scotland
Scott	Leitham	MVA
Allen	Marsden	English Welsh and Scottish Railway
Tom	Matthew	Highlands and Islands Enterprise
Mary	McLaughlin	Scottish Enterprise
Sue	Nicholson	RAC Scotland
David	Reynolds	Glasgow City Council
John	Saunders	City of Edinburgh Council
John	Slater	Edinburgh Chamber of Commerce and Enterprise
Bob	Tait	Scottish Executive
Allan	Woodburn	Colin Buchanan and Partners
John	Yellowlees	Scotrail

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Dr	H	Battu	Aberdeen University
Dr	Glen	Bramley	Heriot Watt University
Dr	Jonathan	Cowie	Glasgow Caledonian University
Professor	John	Dewhurst	Dundee University
Dr	Iain	Docherty	Glasgow University
Professor	John	Farrington	Aberdeen University
Professor	Mary	Gilhooley	Paisley University
Dr	David	Gray	Robert Gordon University
Professor	Alan	McKinnon	Heriot Watt University
Dr	Alistair	Morrison	Glasgow University
Dr	Geoff	Riddington	Glasgow Caledonian University
Dr	Peter	Romilly	Abertay University
Dr	John	Shaw	Aberdeen University
Dr	PJ	Sloane	Aberdeen University
Professor	Austin	Smyth	TRI, Napier University

Appendix 2: Travel by Scottish residents: some National Travel Survey results for 1998/2000 and earlier years Statistical Bulletin: Trn/2002/3, Scottish Executive April 2002

Appendix 2 Table A: Trips per person per year by purpose

	Scottish residents				
	1985/86	1989/91	1992/94	1995/97	1998/2000
Commuting	180	174	162	166	167
Business	27	38	31	37	31
Education	102	72	69	73	70
Escort education	16	29	21	37	25
Shopping	189	237	239	222	234
Other personal business or other escort	159	205	181	186	188
Visiting friends at home	123	156	151	137	132
Visiting friends elsewhere	35	40	33	36	40
Sport / entertainment	62	68	72	61	74
Holiday / day trip	17	27	31	23	28
Other (including "just walk")	63	66	50	51	68
All purposes	972	1,112	1,040	1,028	1,058
Sample size (number of people)	2,560	2,480	2,092	2,032	1,926

Appendix 2 Table B: Average distance travelled per person per year by purpose

	Scottish residents				
	Miles				
	1985/86	1989/91	1992/94	1995/97	1998/2000
Commuting	980	1,084	1,061	1,299	1,392
Business	527	691	680	669	689
Education	162	163	144	171	215
Escort education	23	36	34	72	65
Shopping	541	712	746	919	1,052
Other personal business or other escort	532	847	791	946	1,024
Visiting friends at home	765	1,287	940	1,154	1,020
Visiting friends elsewhere	158	176	174	187	211
Sport / entertainment	324	415	403	430	590
Holiday / day trip	554	854	809	822	873
Other (including "just walk")	85	68	40	49	79
All purposes	4,652	6,333	5,823	6,719	7,210

Appendix 2 Table C: Average length of trip by purpose

				Scottish residents	
				Miles	
	1985/86	1989/91	1992/94	1995/97	1998/2000
Commuting	5.4	6.2	6.5	7.8	8.3
Business	19.4	18.0	22.0	18.2	21.9
Education	1.6	2.3	2.1	2.4	3.1
Escort education	1.4	1.2	1.6	1.9	2.6
Shopping	2.9	3.0	3.1	4.1	4.5
Other personal business or other escort	3.3	4.1	4.4	5.1	5.4
Visiting friends at home	6.2	8.2	6.2	8.4	7.7
Visiting friends elsewhere	4.6	4.5	5.3	5.2	5.3
Sport / entertainment	5.2	6.1	5.6	7.1	8.0
Holiday / day trip	33.5	31.3	26.5	36.1	31.0
Other (including “just walk”)	1.3	1.0	0.8	1.0	1.2
All purposes	4.8	5.7	5.6	6.5	6.8

Appendix 2 Table D: Expenditure on transport within the Scottish Ministers' responsibility, and expenditure on transport controlled by local authorities (Table 11.1, Scottish Transport Statistics No 20, Scottish Executive, 2002, <http://www.scotland.gov.uk/stats/bulletins/103/103-00.asp>)

Outturnestimated outturn									
	1992-93	1993-94	1994-95	1995-96	1996-97	1997-98	1998-99	1999-00	2000-01
£ million at outturn prices									
(a) Expenditure on transport within the Scottish Ministers' responsibility Motorways and trunk roads									
Capital¹									
- New construction and improvements ²	162	176	172	146	125	97	70	46	38
- Other	1	1	1	1	1	1	-	-	1
Total	163	177	173	147	126	98	70	46	39
Current³									
- Routine and winter maintenance etc	35	41	40	53	49	42	52	55	57
- Structural maintenance ²	33	15	35	27	28	31	32	37	45
- Improvements ²	..	..	..	..	..	..	..	..	..
- Design, build, finance, operate payments	-	-	-	2	23	25			
Total	68	56	75	80	77	73	86	115	127
Total capital and current(*)	231	233	248	227	203	171	156	162	166
Local transport - gross capital⁴ expenditure									
Roads - new construction and improvement ⁵	162	166	176	174	102	98	104	94	..
Public transport investment ⁶	23	27	25	17	16	14	15	18	..
Total	185	193	201	191	118	111	119	112	..
Local transport - net capital⁴ expenditure									
Roads - new construction and improvement ⁵	154	162	148	165	87	80	84	79	..
Public transport investment ⁶	11	27	15	10	15	9	14	15	..
Total(*)	165	188	164	175	101	90	97	94	..
Central Government subsidies to transport industries									
Highlands and Islands									
Airports Ltd	5	6	8	11	7	7	6	12	15
Caledonian MacBrayne Ltd	13	13	11	11	10	18	23	21	22
Scottish Transport Group	-	44	-1	-	-	-	-	-	-
Other ⁷	8	11	11	12	12	14	18	36	75
Total(*)	26	74	29	34	29	39	47	69	112
Total excluding Scottish Transport Group	26	30	30	34	29	39	47	69	112
Total within the Scottish Ministers' responsibility (sum of *'d totals)	422	495	441	436	333	300	300	325	..

(b) **Expenditure on transport controlled by local authorities****Local transport - net revenue expenditure^{8,9,10} (excluding loan charges)**

Administration	35	33	34	39	42	43	45	51	..
Road maintenance	217	227	239	213	204	188	195	193	..
Road lighting	42	42	42	38	43	45	43	41	..
Parking	-6	-8	-9	-8	-13	-14	-15	-21	..
Road safety, traffic management and surveys	9	10	11	12	13	13	14	15	..
Concessionary fares	39	42	45	44	44	42	42	41	..
Contributions to passenger transport	73	75	75	82	150 ¹¹	46	42	51	..
School crossing patrols ¹²	..	..	..	..	11	11	11	12	..
Total controlled by Local Authorities	409	420	438	420	492	377	378	384	..

Notes

1. Includes reconstruction, new road surfaces, maintenance of bridges and other road structures.
2. From 2001-02 Roads improvements & Structural Maintenance have been reclassified as current expenditure. Expenditure on structured maintenance" now appears under the "current" heading for earlier years, but it is not possible to separate "improvements" from "new construction" in the capital figures for 2000-01 and earlier years.
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5. From 1992-93 includes expenditure on Toll Bridges, Bridge strengthening (excluding toll bridges), Bridge repairs (excluding toll bridges), Structural maintenance of roads, Bypasses, Road safety-local roads, Bus priority measures, Forest roads, New roads and Improvements and reconstruction (>£2million), and Other road projects (< £2million).
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7. Includes subsidies for the Community Transport Association, freight facilities, shipping, piers, harbours and road safety.
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12. Prior to 1996-97 School Crossing Patrols were recorded on Local Financial Return (LFR 4) Law, Order and Protective Services.

Annotated Bibliography and References

Annotated Bibliography

Author & Title		Topic	Methodology	Findings
1. Adams, J. and Raeside, R. (2001) "Future Scottish air travel: potential policy constraints", <i>Fraser of Allander Quarterly Economic Commentary</i> , 26, 4, 40-45	S	Transport & Economic development (businesses)	Critique of current air passenger forecasting techniques and the policy implications of this.	Any policies to constrain air transport demand are likely to be economically damaging as the environmental benefits are outweighed by the opportunity costs. The most effective way to reduce congestion and emissions would be to provide PT to air terminals. The tourism and electronics industries are very dependent on air transport. Low cost airlines would also suffer – these create employment and help promote social inclusion by providing cheap travel.
2. Bailey, N., Turok, I. and Docherty, I. (1999) <i>Contrasts in Competitiveness and Cohesion</i> , Interim Report of the Central Scotland Integrative Case Study, Urban Studies, University of Glasgow	S	Transport infrastructure and economic development	Review of transport trends and infrastructure in central Scotland	Road is the dominant form of transport - traffic grew by 116% over the period 1975-1995. Journeys by bus and train fell, however air had an increase in growth of 195%. Road traffic is forecast to grow within, rather than between city regions. Rail connections are poor outside greater Glasgow and between Glasgow and Edinburgh. External connections are well served by air, good road links with airports are crucial. Links will be improved by the Rosyth ferry terminal, allowing freight to bypass 'pinch points' in England.
3. Baird, A.J. (2000) <i>Economic Impact of Ports in the North Sea Region</i> , NSR Strategy Study, European Commission		Transport & Economic Development (business)	Review of economic impact studies of ports in the North Sea Region (NSR).	The direct, indirect and induced employment impacts of ports tend to be greater than in many other economic sectors. The impact will be dependent on factors including the type of cargo handled and the local concentration of value added industries such as storage, construction and navigation. They find that major port investments deliver immediate employment and that the employment impact increases with port throughput.
4. Baird, A.J. (1997). "A Scottish east coast European ferry service: review of the issues" <i>Journal of Transport Geography</i> , 5(4), pp 291-302.		Ferries		
5. Baird, A.J. (2000). "Delivering lifeline ferry services" <i>Scottish Transport Review</i> , 10, pp 7-8.		Ferries		
6. Baird, A.J. (2000). "Port privatisation: objectives, extent, process, and the UK experience" <i>International Journal of Maritime Economics</i> , 2(3), pp 177-194.		Port policy		
7. Banister, D. and Berechman, Y. (2001) "Transport investment and the promotion of economic growth" <i>Journal of Transport Geography</i> , 9, 209-218		Link between transport and economic development	Development of conceptual models.	Transport investment will only promote economic growth when all necessary other conditions are met, namely: economic (buoyant economy, quality labour force); policy (political decisions, legal framework, management of infrastructure); investment (availability of funds, location of investment).

8.	Bollinger, C., and Ihlanfeldt, K. (1997) "The impact of rapid rail transit on economic development: the case of Atlanta's MARTA" <i>Journal of Urban Economics</i> , 42, 179-204		Transport and economic development	Simultaneous model of census tract employment and population to study economic impacts of MARTA rail transit system in an area $\frac{1}{4}$ mile around each station.	MARTA has no significant impact on population or employment in areas around stations. It does alter the composition of employment in these areas towards the public sector, but only in those areas with high levels of commercial activity.
9.	Bruinsma, F.R., Rienstra, S.A., and Rietveld, P. (1997) "The economic impacts of the construction of a transport corridor: a multi-level and case study for the construction of the A1 highway in the Netherlands" <i>Regional Studies</i> , 34, 4, 391-402		Transport infrastructure and economic development	Regional labour market model, reference region approach and survey of entrepreneurs.	Entrepreneurs found highway construction positive in terms of level of corporate investment, employees, perceived accessibility, travel and delivery times. Perceptions important as they influence behaviour.
10.	Button, K., Leitham, S., McQuaid, R.W., and Nelson, J.D. (1995) "Transport and industrial and commercial location" <i>The Annals of Regional Science</i> , 29, 189-206	S	Link between transport and economic development	Empirical study based on survey of new premises in Scotland using multivariate analysis to link infrastructure to other spatial attributes that may stimulate economic development.	There are important differences in the type of transport infrastructure investment on firm location. Road and air infrastructure have a greater impact on inward investment than endogenous firms, bus links had a greater importance for large firms. Poor transport infrastructure does not induce firm migration but will influence location decisions for firms on the move.
11.	Carter, C. and Grieco, M. (2000) "New deals, no wheels: social exclusion, tele-options and electronic ontology", <i>Urban Studies</i> , 37, 10, 1735-1748	S	Transport and social inclusion	Theoretical discussion with examples of application of ICT to promote social inclusion in the UK.	ICTs create opportunities for sections of society that were previously excluded from accessing knowledge. Electronic information provides opportunities to break down gender, class and racial boundaries, assist in delivery of the New Deal and improve the transport environment.
12.	Commission for Integrated Transport (2001) <i>European Best Practice in Delivering Integrated Transport: Key Findings</i>		Best practice		
13.	EEDA (2000) <i>Infrastructure Benchmarking Study</i> , Report by Steer Davies Gleave to East of England Development Agency, Cambridge		Transport infrastructure and economic development		
14.	Goldenberg, L., Zhang, J. and Dickson, C. (1998) Assessment of the Joblinks I Demonstration Projects: Connecting People to the Workplace and Implications for Welfare Reform, TRB Paper Number 980813		Transport and social inclusion	US study of unemployed and evaluation of project to link transport measures into employment initiatives.	Problems exist where jobs move from urban centres to outlying areas not served by public transport. Transportation made a difference in enabling disadvantaged people to obtain work. In several demonstration projects, the transportation services provided through the initiative enabled individuals to get a job or to increase work to a full-time basis.
15.	Graham, B. and Guyer, C. (2000) "The role of regional airports and air services in the United Kingdom" <i>Journal of Transport Geography</i> , 8, 249-262		Extra-Scotland infrastructure	Analysis of passenger trends and flights in regional UK airports in the context of the 1998 UK transport white paper. Looks at: sustainable development;	UK policy of expanding regional air services has negative pollution and congestion effects, although the use of larger aircraft helps to offset this. Public transport use is still low, but expected to increase. Regional airports create growth, but also job displacement and local congestion, and air services cannot be integrated into wider

			integration with other modes and economic development.	regional development plans. There is a need to replace 'predict and provide' with demand management to ensure integration with regional growth plans.
16.	Grant, M. (2001) <i>Addressing social exclusion in Liverpool: the role of public transport</i> WHO Centre for Urban Health, WHO Regional Office for Europe, http://www.who.dk	Transport and social inclusion	Analysis of secondary data relating to transport use and needs in Merseyside.	While not a panacea for social exclusion, transport for those who do not have access to a car needs to be addressed at a community level to prevent increased exclusion. Measures could include new ticketing initiatives, new services and community-based transport projects.
17.	Gray, D., Farrington ^b , J., Shaw, J., Martin, S. and Roberts, D. (2001) "Car Dependence in Rural Scotland: transport policy, devolution and the impact of the fuel duty escalator". <i>Journal of Rural Studies</i> , 17, pp 113-125.	S Rural transport		
18.	Grieco, M., Kirby, H.R. and Turner, J. (2000). "A new enlightenment: transport, telematics and the reduction of social exclusion". <i>Scottish Transport Review</i> , 8, pp 8-9.	Travel-to-work and social inclusion	Review of history and potential of ICT to address transport barriers to social inclusion.	There is potential for ICT to enhance the mobility of socially excluded people through: quality information and timetabling; intelligent and in-home reservation systems; on demand transport for those working unsociable hours; expanding the role of the third sector through private car use where deregulated bus services fall short of service requirements; and through the extension of car clubs to cover low income areas.
19.	Hakfoort, J., Poot, T. and Rietveld, P. (2001) "The regional economic impact of an airport: the case of Amsterdam Schipol airport" <i>Regional Studies</i> , 35, 7, 595-604	Transport infrastructure and economic development	Social accounting matrix (an extended input-output model looking at production, employment and consumption). Compares actual growth with projected growth assuming o growth of aviation activities.	Growth of airport does lead to growth in employment. Multiplier effect of direct employment in Schipol is approx. 2:1, i.e. 1 airport job leads to 2 induced and indirect jobs in the region.
20.	Hall, P., Breheny, M., McQuaid, R.W. and D. Hart (1988) <i>Western Sunrise - The Genesis and Growth of Britain's Major High-Tech Corridor</i> , Routledge, London			
21.	Hamilton, K. and Jenkins, L. (2000) "A gender audit for public transport: a new policy tool in the tackling of social exclusion" <i>Urban Studies</i> , 37, 10, 1793-1800	Transport and social inclusion	Analysis of secondary data (mainly UK government stats) on travel patterns of women compared with those of men.	Poor transport limits womens' employment and quality of life, as women rely more upon trip-chaining, off-peak travel (due to PT work). Reforming public transport to meet the needs of women will have commercial, inclusion and environmental benefits.
22.	Hine, J. and Mitchell, F. (2001) "Better for everyone? Travel experiences and transport exclusion" <i>Urban Studies</i> , 38, 2, 319-332	S Transport and social inclusion	Case study approach examining personal accounts of individuals' travel experiences.	Transport policy often fails to include the needs of all individuals. There are significant problems common across different groups of society: physical, temporal, economic, spatial and psychological. Transport policy appraisal should incorporate these social factors in cost-benefit analysis.
23.	Hine, J. and Mitchell, F. (2001) <i>The Role of Transport in Social Exclusion in Urban Scotland</i>	S Transport and social inclusion	Interviews, focus groups and travel diaries held with socially excluded	Improvements to transport services can help promote social inclusion. Groups who stand to benefit are disabled (physical, fear, space, time), the elderly (physical, time),

			groups in 3 urban areas in Scotland.	those without a car who live in peripheral estates (geographical), low income groups (economic, time), bus users (time) and women (fear, time).
24. Hine, J.P. (2000). Integration, integration...planning for sustainable and integrated transport systems in the new millennium. <i>Journal of Transport Policy</i> , 7(3), pp 175-177.		Sustainable transport		
25. Hine, J.P., Rye, T. and Hulse, M. (2000). Using planning to manage transport demand: a survey of Scottish experience. <i>Local Environment</i> , 5(1), pp 33-55.	S	Planning and land use		
26. Holzer, H.J. 1991. The spatial mismatch hypothesis: What has the evidence shown. <i>Urban Studies</i> 28: 105		Spatial mismatch		Sets out issues concerning spatial mismatch. Many other papers have also been written on spatial mismatch more recently.
27. Houston, D. (2001) "Testing the Spatial Mismatch Hypothesis in the United Kingdom Using Evidence from Firm Relocations" in Pitfield, D. (Ed.) <i>Transport Planning, Logistics and Spatial Mismatch, European Research in Regional Science</i> , 11, Pion, London.	S	Travel-to-work and labour supply	Retrospective longitudinal study of firms who have relocated to decentralised locations within the Glasgow conurbation and how this has affected the their employees.	When firms relocate and decentralise it creates difficulties for certain groups of workers that cannot relocate or move house, particularly lower paid and lower skilled workers and those dependent on PT, especially women. Improvements in transport infrastructure would partially alleviate this, however decentralised locations are more difficult to service by PT.
28. Kirby, H.R. (1998). Foresight is better than hindsight. <i>Scottish Transport Review</i> , 1, pp 20-22.				
29. Kirby, H.R., Hutton, B., McQuaid, R.W., Raeside, R. and Zhang, X. (2000) "Modelling The Effects Of Transport Policy Levers On Fuel Efficiency And National Fuel Consumption", <i>Transportation Research D</i> , 5, 4, 265-282		Effect of petrol prices and other factors upon fuel consumption	The paper sets out and tests, using UK data, the main features of a Vehicle Market Model which estimates changes to vehicle stock/kilometrage, fuel consumed and CO ₂ emitted.	The most significant variable influencing fuel consumption of vehicles was consumption in the previous year, followed by dummy variables related to engine size, the time trend (a proxy for technological improvements), and then fuel price. The results suggest that the effectiveness of using fuel prices as a direct policy tool to reduce fuel consumption may be limited. However, fuel prices may have significant indirect impacts (such as influencing people to purchase more fuel efficient cars and vehicle manufacturers to invest in developing fuel efficient technology) as may other factors such as the threat of legislation.
30. Lawless, P. (1999) "Transport investment and urban regeneration in a provincial city: Sheffield, 1992-96" <i>Environment and Planning C</i> , 17, 211-226		Transport and economic development	Before and after survey of the effects of new tram system and enhanced road provision on image, property, land use, business (re)location & and labour mobility.	Investment in transport had a minimal effect on regeneration, with road investment being more beneficial than the tram. There is a problem of lack of integration between regeneration and transport providers that hinders the benefits of public transport investment.
31. Lawless, P. and Gore, T. (1999) "Urban regeneration and transport investment: a case study of Glasgow City Centre"		Transport and economic development	Break down impacts of investment into 5 areas (image, property, land use, business (re)location & and labour mobility.	Impact of transport investment on regeneration is weak, partly due to lack of co-ordination between transport and regeneration providers.

			study of Sheffield 1992-96" <i>Urban Studies</i> , 36, 3, 527-545	property, land use, business location & operations and labour market) explore effects on each	regeneration policy and fragmentation of urban governance.
32.	Leitham, S., McQuaid, R.W., and Nelson, J.D. (2000) "The Influence Of Transport On Industrial Location Choice: A Stated Preference Experiment", <i>Transportation Research A</i> , 34, 515-535	S	Link between transport and firm location	Empirical stated preference study of 40 firms in West Central Scotland.	Firm location factors were found to vary according to the origin of the firm - classified as local relocations, foreign inward investors, and branch plants sourced from national bases. The importance of road links to location choice varied considerably between these groups with the latter rating motorway links the highest of any of the groups of firms. In contrast, overseas sourced branch firms found road links largely unimportant, being outweighed primarily by considerations of workforce and premises. Local relocations fell into two distinct groups with respect to the importance attached to road links (between relatively important and non-important), whilst considering the other factors similarly. Good public transport provision emerged as a statistically significant factor in certain scenarios.
33.	McCalla, R.J., Slack, B., and Comtois, C. (2001) "Intermodal freight terminals: locality and industrial linkages" <i>Canadian Geographer</i> , 45, 3, 404-413		Link between transport and economic development	Empirical study of businesses around freight terminals in 3 seaports and 2 rail yards in Canada	The functional ties between the industries and the terminals is relatively weak, with less than 30% of firms using adjacent terminals for their own freight and only 3% citing the terminals as the primary location factor.
34.	McGregor, A. and McConnachie, M. (1995) "Social exclusion, urban regeneration and economic reintegration" <i>Urban Studies</i> , 32,10,1587-1600	S	Transport and social inclusion		Shortage of local jobs and poor transport access to employment are two main factors contributing to spatial concentration of disadvantage. There is therefore a need for more employment creation in disadvantaged neighbourhoods.
35.	McGregor, A., Fitzpatrick, Z. and Glass, A (1998) <i>Regeneration areas and barriers to employment</i> , Edinburgh, Scottish Executive, Central Research Unit	S	Transport and social inclusion	Survey of residents of regeneration areas	Travel problems, connected with childcare, low wages and part-time work can act as a barrier to employment. Some employers also discriminated on travel-to-work grounds.
36.	McKinnon, A. (1998) "The impact of traffic congestion on logistical efficiency" Heriot- Watt University Institute of Logistics Research Series		Link between transport and economic development	Interviews with companies involved in freight distribution.	Although the effects of congestion on logistics are difficult to quantify, most companies found the effect on operating costs, inventory levels and investment in materials handling and IT to be weak or non-existent. Congestion did have some effect on labour costs and was a factor behind strategic decisions to increase depot numbers. FR: A need to conduct a wide-ranging survey of the impact of congestion on logistic operations across a wide range of companies and supplement this with direct observation and measurement.
37.	McLintock, H. (1998) "Linking sustainable transport with economic development", <i>Cities</i> , 15, 6, 475-477		Transport and economic development	Review of "Moving the Economy" conference, Toronto, July 1998.	Investment in sustainable transport is necessary to make towns and cities attractive places for businesses to locate. Studies report no link between road infrastructure and economic development. In addition, less spending on roads frees up

				more resources for other economic development initiatives, such as job creation.
38.	McQuaid, R.W., Greig, M. and Adams, J. (2001) "Unemployed Job Seeker Attitudes Towards Potential Travel-to-Work Times", <i>Growth and Change</i> , 32, 4, 356-69	S	Travel-to-work	Survey of 306 unemployed in West Lothian and Edinburgh. Identified factors associated with willingness to commute longer distance.
39.	McQuaid, R.W., and Greig, M. (2001) "A Model Of the Commuting Range of Unemployed Job Seekers", in D. Pitfield (ed.), <i>Transport Planning, Logistics and Spatial Mismatch</i> , (London, Pion), pp. 152-166	S	Travel-to-work	Survey of 306 unemployed in West Lothian and Edinburgh
40.	McQuaid, R.W., Leitham, S. and Nelson, J.D. (1996) "Accessibility and Location Decisions in a Peripheral Region of Europe - a Logit Analysis", <i>Regional Studies</i> , 30, 6, 589-598	S	Transport and industrial location	Survey of 939 firms in West central Scotland.
41.	Monk, S., Dunn, J., Fitzgerald, M. and Hodge, I. (1999) <i>Finding work in rural areas: barriers and bridges</i> York: Joseph Rowntree Foundation		Transport and social inclusion	Survey of residents of rural areas in England
42.	Noland, R. and Cowart, W. (2000) "Analysis of metropolitan highway capacity and the growth in vehicle miles of travel"		Travel-to-work and congestion	2SLS approach to model the induced effect of highway capacity in terms of lane mile additions upon vehicle miles travelled (VMT).
43.	OECD (2002) <i>Impact of Transport Infrastructure Investment on Regional Development</i> , OECD Publications, Paris		Impact analysis	
44.	O'Mahony, M., Geraghty, D. and Humphreys, I. (2000) "Distance and time based road pricing trial in Dublin", <i>Transportation</i> , 27, 269-283		Travel-to-work and congestion	Empirical pilot study of imposing road pricing on a sample of motorists to observe their travel behaviour.
45.	Oosterhaven, J., Gerard, J., and Stelder, D. (2001) <i>Clusters, linkages and Interregional spillovers: "Methodology and</i>		Link between transport and economic development	Using bi-regional input-output data to examine inter and intra regional clusters
				The paper presents and tests a model of factors influencing the maximum time unemployed job seekers would be willing to travel to a potential new job. Significant effects were found for a range of personal and demographic characteristics, including being female and having dependents, and years of education, type of job, and location.
				The paper Factor Analysis to analyse willingness to travel to a new job, and developed a basic model based upon the categories of: innate social characteristics; acquired human capital characteristics; financial characteristics; the characteristics of potential jobs that the person may apply for; and the local context. They identified 10 groups of factors. In particular 'female flexible workers' and the 'low skilled and long-term unemployed' were associated with willingness to travel for shorter times. Factors 'requiring suitable permanent jobs', 'good jobs', and 'accessible private housing' showed a willingness to commute for longer times.
				A series of models are established which indicate that there are significant differences in the influence of different forms of accessibility on the location decisions of different types of firm. Accessibility to staff is relatively important for large firms, accessibility to suppliers important for inward investors, and accessibility to markets for firms in larger premises and those in the central city.
				Lack of access to private transport prevented many unemployed people from gaining employment, as public transport provision in these areas was inadequate.
				Lane mile additions account for around 15% of the annual increase in VMT. This proportion is larger in metropolitan areas with a faster annual growth in VMT.
				Road pricing at marginal external cost is effective in reducing car journeys, congestion and encourages transfer to other modes of transport.
				The links to transport are relatively weak in the two clusters, in contrast to popular belief. This has policy implications – namely that investment in major transport hubs is

		policy implications for the two Dutch mainports and the rural north" <i>Regional Studies</i> , 35, 9, 809-822	development	and linkages and the interregional spillovers.	less critical to the local economy that was previously thought.
46.		Pickup, L. (1989) "Women's travel requirements: employment, with domestic constraints" in Grieco, M., Pickup, L. and Whipp, R (1989) <i>Gender, Transport and Employment: the impact of travel constraints</i> , Aldershot: Gower	Transport and social inclusion	Empirical study of married women	Women face mobility problems due to their household responsibilities as housewives and mothers. This could limit their choice of employment.
47.		Priemus, H. and Konings, R. (2000) "Public transport in urbanised regions: the missing link in the pursuit of economic vitality of cities" <i>Planning practice and Research</i> , 15, 3, 233-245	Transport and economic development	Assessment of policies in the Netherlands designed to revitalise cities and the role of public transport in these.	Improvements in urban public transport are vital for urban renewal. Benefits may include improvements in housing stock and business activity. To ensure maximum urban renewal effects, transport policies must be linked into national transport network and controlled by city administrations in conjunction with other regions, public consultation, transport companies and real-estate developers.
48.	S	Ryley, T. and A. Smyth (2000) Transport Briefing Paper for the Scottish Parliament Transport and Environment Committee, TRI, Napier University.	General	General Briefing Paper for Scottish Parliament	
49.		Ryuzo, S. (2000) "Transportation and economic development: a US-Japan comparison" <i>Japan and the World Economy</i> , 12, 103-106	Transport and economic development	Empirical study based on author's experience.	Japan is becoming increasingly car-dependant which has negative implications for inner-city economies centred around train stations. The upgrading of bullet trains has led to the development of tourism in more remote communities at the expense of those closer to Tokyo.
50.		SACTRA (1999) <i>Transport and the Economy</i> Standing Advisory Committee on Trunk Road Assessment, DETR	Transport and social inclusion	Report on current and potential developments in ICT to reduce social exclusion through improved transport provision.	There is a role for telematics to substitute for journeys, to facilitate initiatives such as community car clubs, to provide 'on demand' special transport and improve information on public transport routes and times.
51.		Select Committee on Education and Employment (1998) <i>Education and Employment - 7th report: Overcoming Barriers to paid employment for lone parents</i> , [online]: http://www.parliament.the-stationery-office.co.uk/pa/cm199798/cms/elect/cmduemp/646/64602.htm	Transport and social inclusion	Committee report.	Lone parents are at a disadvantage in getting to work as only 35% have access to a car, compared with 90% of couples with children.
52.	S	Sinclair, S.P., and Sinclair, F. (2001) <i>Access All Areas? An Assessment of Social Inclusion Measures in Scottish Local Transport Strategies</i> , Edinburgh, CRSIS, Edinburgh College of Art/Heriot-Watt University.	Transport and social inclusion	Published and empirical data.	52% of jobseekers identified lack of transport as an important barrier to employment. 10% of unemployed people had rejected job offers because of transport difficulties. Around 15% cited transport problems had been a deterrent from even looking for work. Recommendations include need for: clear and detailed transport strategies and policies that are co-ordinated

			with other policy areas; transport audits; improving the quality of buses; providing transport information; extending concessions eligibility; and providing non-mainstream services.
53. Stafford, B., Heaver, C., Ashworth, K., Bates, C., Walker, R., McKay, S. and Trickey, H. (1999) <i>Young men's experience of the labour market</i> York: Joseph Rowntree Foundation	Transport and social inclusion	Study of unemployed men and women.	Possession of a driving licence increased the chance of finding work among men and women aged 18-24. This may not always be because of travel-to-work problems – a driving licence may be an essential part of an employer's person specification and be seen as a proxy for motivation.
54. Tompkins, J., Topham, N., Twomey, J. and Ward, R. (1998) "Noise versus access: the impact of an airport in an urban property market" <i>Urban Studies</i> , 35, 2, 243-258	Transport infrastructure and economic development	Regression of log of property prices on a range of variables	Positive aspects of airports such as access and employment opportunities may more than offset the negative externality effects of noise etc.
55. Turner, J., Grieco, M., Apt, N. and Holmes, L. (2000). "Women's mobility and welfare to work: the need for appropriate transport policies" <i>Local Economy</i> , 15, 1, 68-73.			
56. Turner, T., Niemeier, D., 1997. Travel-to-work and Household Responsibility: New Evidence. <i>Transportation</i> , 24, 397-419	Transport and social inclusion	US study of travel patterns among women	Household responsibility hypothesis. Women face constraints in their travel patterns, and hence employment opportunities, due to the burdens of household responsibility.
57. Van den berg, L. and Pol, P.M.J. (1998) "The urban implications of the developing European high-speed train network" <i>Environment and Planning C</i> , 16, 483-497	Transport infrastructure and economic development	International comparative investigation between 14 European cities. Look at impacts of accessibility, economic potential, living environment, balanced spatial distribution of activities, balanced social distn of effects, organising capacity.	HST networks can boost inner-city revitalisation on all of the judged criteria, although developments must be tailored for the particular needs of each city to avoid dangers of displacement of economic activity from areas not served by stations, and a balance found between station accessibility and environment.
58. Vickerman, R., Spiekermann, K., and Wegener, M. (1999) "Accessibility and economic development in Europe" <i>Regional Studies</i> , 33,1, 1-15	Transport and economic development	Identifies problems in existing methods of measuring accessibility and develops new measures.	It is doubtful whether Trans-European Networks (TENs) promote convergence in accessibility and economic development in the EU.
59. Villaverde Castro, J. and Coto-Millan, P. (1997) "Economic impact analysis of Santander port on its hinterland", <i>International Journal of Transport Economics</i> , 24, 259-277	Transport infrastructure and economic development	Two separate methodologies, the first using an empirical survey to provide an approximation, the second using input-output tables to estimate accurate direct, indirect and induced impacts.	Direct estimation of value of port to the economy was 14,325 million Pesetas. Input-output analysis showed a contribution of 6% to regional GNP and 7% to employment in Cantabria. This implies that the productivity of the port and its agents is less than the average for the region, but in line with other service industries.
60. Williams, H.C. (1998) "Congestion, traffic growth and transport investment", <i>Journal of Transport Economics and</i>	Travel-to-work and congestion	General equilibrium model of the effects of highway investment policy intervention	Mis-specification of simple demand elasticity travel models can occur when using to forecast the effects of policy. If alternative modes of transport are available,

		taking into account cross-elasticity of different travel markets. Examination of multiplier effects on equilibrium states.	cross elasticities of demand will result in a decrease in a reduction in traffic congestion when road capacity is reduced.
61. Zax, J.S., and Kain, J.F. (1996) "Moving to the Suburbs: Do Relocating Companies Leave Their Black Employees Behind?" <i>Journal of Labour Economics</i> , 14, 3, 472-504	Transport and social inclusion	Examination of move and quit probabilities based on the responses of black and white workers to their employer's relocation from downtown Detroit to suburban Dearborn.	White employees whose commutes lengthened because of the relocation were more likely to move, but no more likely to quit, but black employees whose commutes lengthened were more likely to both move and quit due to employer relocation. The restrictions on black residential choice forced approximately 11 percent of black workers to quit in the wake of the relocation.
62. Zenou, Y. (2000) "Urban unemployment, agglomeration and transportation policies", <i>Journal of Public Economics</i> , 77, 97-133	Transport and social inclusion	Theoretical model based on residence of workers relative to employment in a monocentric city.	Improving transport by subsidising commuting costs of all workers reduces urban unemployment, but increases inequality, whereas a policy of subsidising transport for only the unemployed reduces inequality but increases unemployment.

'S' means that the study primarily uses Scottish data or is about transport in Scotland.

Other References

The many official reports and studies for public agencies are not included above. The Scottish Transport Studies Group maintains a record of academic references concerning transport and Scotland (e.g. see the *Scottish Transport Review*).

