

Economic Effects of Road Infrastructure Improvements: Stage 3 Report

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1 INTRODUCTION

STUDY AIMS

- 1.1 DTZ Pidea Consulting was appointed by the National Assembly for Wales to undertake a study to develop an improved understanding of the impact of major road transport infrastructure improvements on economic development in Wales. The study aimed to inform the appraisal of future projects and to bring forward recommendations for appraisal procedures.
- 1.2 In common with government in the rest of the United Kingdom, the Welsh Assembly Government faces pressure from local and sector bodies to increase spending on transport, especially on roads projects. In many cases, it is argued that these projects will produce local, regional or, less commonly, national economic development benefits. Projects which are “promoted” on economic development grounds typically involve routes in or connecting to areas of past industrial decline which are targeted for regeneration or projects which will increase the accessibility of rural areas.
- 1.3 It follows that there is a need for procedures which will enable the economic development impact of projects to be established, assessed and quantified. Such procedures should be robust, reliable and produce results which will withstand independent scrutiny.
- 1.4 The need for such “standardised” procedures has been recognised in a number of policy documents including the work of the Department of Transport’s Standing Advisory Committee on Trunk Road Assessment (SACTRA). We consider later in the report the progress that has been made in developing standard procedures but can state at the outset that there is no agreed or universally accepted methodology analysing the economic development impacts of roads investment. The evidence which is advanced in support of claims of economic development benefits is variable in terms of scope and quantity. Further, while roads projects **are** subject to standard assessments of cost and benefit, it is widely argued that these procedures do not capture – or at least represent – all of the economic development benefits of projects.
- 1.5 The brief for the present study defined three stages of work:
 - Stage 1: to undertake a comprehensive review of previous studies which have sought to assess the economic development impact of roads and to develop proposals, drawn up in the light of that review, for the methodology to be employed in Stage 2;

- Stage 2: case study investigation of the impact of road infrastructure improvements; and
- Stage 3: analysis and development of conclusions concerning the circumstances in which road infrastructure improvements will have significant effects on the location of economic activity.

REPORT STRUCTURE

1.6 The results of the initial literature review were set out in an Interim Report and the findings of the case study work are presented in detail in a separate volume. The present report addresses the Stage 3 outputs but also presents an overview of the whole study and of the findings of each stage of work. The report is set out as follows:

- The mechanisms by which investment in roads (or other transport infrastructure) may impact on economic development are outlined below;
- Section 2 provides a brief review of the principal methodologies employed in the appraisal and assessment of transport projects;
- Section 3 provides a summary of the results of the literature review;
- Section 4 sets out in summary from the results of the case study work carried out in Stage 2 of the study; and,
- Section 5 presents overall conclusions concerning the economic impact of roads projects and considers the implications for appraisal of such projects.

TRANSPORT INFRASTRUCTURE INVESTMENT AND THE ECONOMY

1.7 An effective transport network which makes possible the rapid movement of goods and people is, self-evidently, an essential requirement of a modern economy. Although aspects of the quality of the UK network are subject to much criticism, it is the case that – in common with all other developed countries, the UK has a mature, complex and comprehensive transport network.

1.8 Nevertheless, it is often argued that improvements to or additions to the network will stimulate or strengthen economic growth in particular areas. Before reviewing the evidence of and claims made by existing studies, we consider below the means by which improvements in the transport network may impact on the growth of the economy.

- 1.9 As already stated, the UK transport network is comprehensive and – remote island communities aside – any community is fully accessible at least by road at all times. Investment in transport infrastructure can make journeys faster, more fuel efficient or more predictable in terms of journey time. Broadly speaking then, the economic effect of roads investment in the UK is to reduce the cost of travel – mainly in terms of the time cost. If journey reliability is increased then costs associated with unpredictability and risk may also be reduced. That said, we may consider how reductions in the cost – broadly defined - of movement can affect the capacity of the economy – at whatever geographical level - to produce and consume. It is also important to consider whether the effects are on economic activity at a national, regional or local level.
- 1.10 **Lower Costs of Production** Perhaps the most obvious potential effect is that transport improvements can reduce business transport costs and thus lower the overall costs of production thus enabling businesses to operate more efficiently. At the most elementary level in a competitive market reduced variable costs would normally lead to an increase in output. Looking at this from the perspective of an individual business, if the transport investment leads to reduced transport costs relative to competitors in other locations then the firm should be able to gain market share and expand. Firms in areas where transport costs have fallen may, therefore, be expected to expand output and employment.
- 1.11 From the standpoint of the *national* economy net output may be increased because overall national costs have been reduced. However, it may also be the case that increases in output at a local level *displace* production elsewhere – i.e. by improving the competitive position of firms in one location relative to firms elsewhere.
- 1.12 **Widening Labour Catchment Areas** Access improvements and reduced travel costs may lead to the labour catchment area for businesses being widened. This could ease recruitment problems (if they exist) by expanding the potential labour pool. However, transport improvements affect ease of movement in *both* directions and infrastructure improvements which make it easier for people to work elsewhere may lead to tighter local labour market conditions. This type of impact is likely to benefit one area at the expense of another unless the transport improvement increases access to employment for people who were previously unable to secure employment at all.
- 1.13 **Increased Competition** The provision of improved transport infrastructure may open an area to external competition which would reduce prices for businesses and consumers in that area. This may be regarded as net benefit at the national as well as local level but will create losses for some local businesses.

- 1.14 **Stimulate Inward Investment** Enhancing transport infrastructure may increase the attractiveness of an area to new businesses which will lead to increased employment opportunities. These business may be new to the UK as a whole (e.g. foreign direct investment) or new to the local/regional economy (e.g. they have relocated from elsewhere in the UK). The origin of the relocating business is important in economic development terms as its presence in one area may be at the expense of another area.
- 1.15 **Reorganisation of Land Use** Transport improvements may lead to a change in the pattern of land use around the transport improvement, with more transport intensive uses – including consumer activities - locating closer to transport interchanges. Commercial, Retail and Residential development may be affected. These impacts can be important at a local level but basically affect the geographical pattern of activity rather than the overall level of activity. The effects are, therefore, local rather than national or even regional.
- 1.16 **Opening Inaccessible Sites for Development** New or enhanced transport infrastructure may enable some sites to be brought forward for development which would not otherwise have been possible. This will create employment opportunities at these new sites. As above, these impacts are local rather than national or even regional in character.

2 MEASURING ECONOMIC IMPACTS

INTRODUCTION

- 2.1 This section considers the principal methodologies currently used in the economic appraisal and assessment of road investment. The rationale for and the strengths and weaknesses of each method are considered. It is important to distinguish between the standard cost-benefit appraisal of projects and methodologies which aim to assess wider economic impacts. The standard cost benefit approach is considered first.

COST BENEFIT APPRAISAL

- 2.2 Major road investment projects in the UK are assessed using a standard form of cost benefit analysis. This is a complex and highly technical field and only a brief summary of the approach can be presented here. The computational program used for this work (COBA) was developed in the 1970s. Over the last two decades, various refinements have been made to this approach and other models and programs have been introduced. However, most of these developments in appraisal have been concerned with technical issues such as the measurement of travel demand. The basic economic principles at the heart of the approach remain largely unchanged. It is, however, important to distinguish between the principles of cost benefit analysis – or an “ideal” cost benefit analysis – and the practical application of the approach in the standard COBA model.
- 2.3 Cost Benefit analysis seeks to measure (in monetary terms) the costs and benefits of the project. For roads projects there are costs involved in building and operating the road. Benefits are enjoyed by road users in the form of (generally) journeys which are cheaper, faster and safer than before. The benefits of roads projects are thus considered to be time and cost savings for individuals and businesses and any reduction in accidents. Measuring these costs savings is a complex matter – for example time savings are translated into monetary benefits using values for time saved (usually with a different figure for private and business journeys) while accident reductions are valued in terms of the value for each life saved or injury prevented.

- 2.4 The fundamental aim of the Cost Benefit approach is to establish by how much a project will increase (or reduce) national economic welfare (broadly “wealth”). It is argued that CBA methodology takes full account of the economic benefits of roads projects in that it measures not only the benefits of projects to individuals as road users but also reductions in business transport costs and thus in the costs of producing goods and services. Reducing production costs is the mechanism through which road investment will lead to increased economic activity.
- 2.5 There are a number of criticisms which can be levelled at the standard model within its own principles. Thus it is argued that :
- The conventional approach uses very broad estimates of the value of transport improvements to businesses and is particularly deficient in the measurement of such factors as the value of business time travel savings, freight transport time savings and improved service reliability
 - Market imperfections may mean that prices and costs used in appraisals do not correctly reflect the economic value of the resources used/saved as a consequence of the project so producing an incorrect result. This may occur in a number of ways
 - where transport produces costs which not reflected in prices (e.g. congestion or pollution) the costs of a project may be understated.
 - here a project leads to job creation which employs people who would otherwise remain unemployed so that the costs to businesses of employing these persons (their wages) exceed the opportunity cost to society (since they would otherwise be producing nothing)
 - Where impediments to movement result in a lack of competition in markets, transport improvements which open up areas to competition will produce “additional” economic benefits
- 2.6 The first bullet point and the first sub point under the second bullet are essentially reasons why COBA may produce the “wrong” answer in its own terms and the solution would be to improve the accuracy of the inputs to the analysis rather than to change or supplement the form of analysis. The issues around employment creation and competition are more complex and will be returned to below.
- 2.7 A second set of criticisms concern the “static” nature of the analysis – it is argued that major transport investments may enable production to be re-organised in ways which produce external economies of agglomeration and increased productivity. This dynamic analysis is strong on theory but much weaker on empirical analysis and is, in any case, relevant only to changes which are large enough to have fundamental impacts – one might suggest that we are considering here projects of at least the scale and importance of the first Severn Estuary crossing. The SACTRA report concluded that these theoretical considerations were of little relevance et most transport investment decisions.

- 2.8 The third criticism is that irrespective of whether or not COBA fully reflects national economic benefits from transport investment, it does not provide the detailed analysis required to assess the economic development “case” for investment. Thus, it does not detail the distribution between local areas and communities of costs and benefits. Where economic development is an issue in transport investment decisions it is generally in the context of impacts on specific areas or localities rather than the country as a whole. Thus it may be an objective of policy to promote the economic development of a particular town which has been adversely affected by economic change even if such development is broadly at the expense of other areas.
- 2.9 The case for local area regeneration can be expressed or justified in terms of the divergence between wages and the opportunity cost of labour as noted above. The line taken by HM Treasury is that adjusting cost benefit analysis to take account of divergences between wages and supposed opportunity cost of labour is not appropriate in a developed economy such as the UK. In any event, there are no estimates on which such adjustments could be made on a case by case basis. What is agreed is that an objective of policy can be to promote increased employment and economic activity in specific areas and that the cost effectiveness of alternative means of so doing should be compared.
- 2.10 The theoretical argument over this issue of whether cost benefit analysis – either in principle or as practised in UK roads project appraisal – fully captures all of the economic development benefits of roads investment can become sterile. This issue is, however, reconsidered in the report conclusions. What is more relevant at this point is that the CBA methodology reduces such benefits to a monetary value and considers the balance of cost benefit at the national level. While this is necessary in a cost benefit appraisal, it does not provide information on the distribution of benefits, the location of beneficiaries or the impact on factors such as employment which are central to economic development objectives. In brief, *even if* the COBA analysis accurately captures the value of economic development gains at the national level, it does not provide the detailed information required to assess the contribution of a project to local or even regional development objectives.
- 2.11 A number of studies have sought to examine the specific economic development impacts of road improvements. These studies have generally attempted to establish and sometimes to quantify impacts of road projects on economic activity and employment in specific locations. Section 3 reviews the key findings of a representative range of such studies. Before that, the approaches adopted in these studies are discussed below.

ALTERNATIVE METHODOLOGIES

Surveys

- 2.12 Survey-based studies are one of the most commonly used approaches to assessing the economic impact of potential road improvements. The usual approach is to survey businesses which are thought likely to have been affected by the proposed development – generally firms located in areas served by the road. Most of the surveys have focused on the manufacturing and distribution sectors, reflecting the assumption that the main transport cost savings are likely to be related to the movement of goods. However, more recent studies have undertaken broader surveys covering sectors of the economy where the movement of people is also important.
- 2.13 The survey technique most commonly used is to issue postal questionnaires to a sample of businesses in the relevant geographical areas and to supplement these responses with a smaller number of face to face interviews. Depending on the timing of the studies vis-à-vis the actual construction project, it may be possible to conduct “before” and “after” surveys which seek to obtain information from the company relating to the situation before the road improvements and after the road improvements.
- 2.14 Ideally, the sample of businesses in the “before” and “after” analysis would be the same, but business closures and new starts usually mean that the sample changes. This can make problems of comparison difficult – particularly if there are doubts, discussed further below, over the statistical representatives of the sample.
- 2.15 The main topics which are usually covered by business surveys are:
- General business information covering movement of goods, markets served, transport costs, suppliers etc;
 - Access to markets including existing markets, new markets etc;
 - Access to suppliers including existing suppliers, new suppliers etc.;
 - Changes to goods movement made in response to roads investment;
 - Changes in labour catchment areas resulting from roads investment;
 - Impacts of roads investment on location decisions;

- Disadvantages arising from investment e.g. increased competition.

2.16 The analysis of these surveys is often restricted to identifying the proportion of businesses in the survey responding with a specific answer e.g. “51% of large manufacturing and 56% of small manufacturing establishments said that the M4 would improve access to their suppliers” (paragraph 2.20 Welsh Office 1981). Hence, it is difficult to quantify the actual effect of the road improvement on measures of business performance such as changes in output and employment.

2.17 While these surveys provide an insight into the type of effects experienced by different businesses, they are less commonly used to provide quantified assessments of the impact of the project on production costs, output and employment. Some studies have sought to scale impacts – i.e. minor, moderate, major.

2.18 The representativeness of surveys of this type is open to doubt and this may call into question the validity of the results. In survey research - if results are to be statistically significant - it is important to ensure that data are collected from a sample of firms which is representative of the overall population of businesses concerned. Few surveys of businesses affected by transport projects conform to this requirement. This, in itself, limits the extent to which such surveys can be used to produce statistically reliable quantified estimates of impact.

2.19 An alternative method, which does not seek to produce results within statistical margins of error but which can be reliable in a broader sense, involves case study analyses of key and “typical” businesses. This approach involves a limited number of “in-depth” face-to-face interviews with businesses to gain a proper understanding of their business and of the impact of transport improvements. The interviews would cover the following topics:

- Type of business;
- Recent business performance;
- Customers and markets (including key locations of suppliers and competitors);
- Transport requirements for deliveries, supplies, business travel and commuting (including number of trips made and to where);
- Modes of transport used and expenditure on travel and transport in total and as a proportion of business costs; and

- Potential impact of transport improvement (e.g. – number of journeys/trips affected, impact on transport costs and overall operating costs, type of trips/journeys affected - movement of goods, business trips, journeys to work – impacts on investment or location decisions, other benefits to and impacts on the business).

2.20 The aim of the approach would be to probe these issues in depth and to explore fully the validity of estimates of benefit or impact. This detailed analysis allows a greater understanding of businesses requirements for transport and how a particular development would impact on the operations of the business. Because it is not based on a random sample of firms there are objections to any “grossing up” of the results to an economy wide level but we consider that the approach offers a means of deriving parameters which can be used to estimate the impact of the project on **types** of business – e.g. firms in particular sectors, firms serving different markets.

A Priori Analysis - Elasticity Calculations

2.21 Quantification of the impact of a road improvement on particular sectors of the economy (e.g. manufacturing) has been made in some studies through calculations which assume that there is a predictable relationship between changes in cost and changes in output – i.e. an elasticity of output with respect to a cost reduction. The approach involves deriving from transport modelling and/or a Cost benefit study an estimate of the impact of the road investment on total business transport costs for firms within a designated area. This figure is then expressed as a reduction in total production costs and the impact on output is predicted by applying the estimated elasticity figure.

2.22 The predicted increase in output can be translated into an increase in employment by using data for output per worker by sector which can be derived from published statistics. The main weakness with this approach is that it is dependent on the validity of the assumptions made concerning key parameters– especially the elasticity figure which is usually a very broad estimate. In the studies which have been reviewed, the parameters have not been derived from any survey work carried out for the particular project and the source of the assumptions is often not clear. The values are also assumed to apply to all businesses in the sector under consideration. Again this is a very broad assumption. Even if the overall result is “broadly correct”, the analysis does not highlight businesses or activities which may benefit and those which may be adversely affected.

2.23 Moreover, this approach measures only the impact on the existing industrial structure of an area – it cannot capture possible impacts of transport investment on the in-movement of new businesses to an area or on the re-organisation of businesses.

Input – Output Analysis

- 2.24 Some studies have used Input – Output analysis to determine the effect on output, income and employment across all sectors of the economy of a saving in transport costs. This is a more sophisticated version of the elasticity approach and has the advantages of being likely to be more accurate and able to produce specific impact estimates for all sectors of the economy.
- 2.25 The approach is subject to the same concerns over accuracy of cost estimates as is the elasticities approach. A further problem is the limited availability of input – output models. The availability of complete input – output tables below national level is very limited. This means that the scope for using this framework for regional or sub-regional analysis is restricted.¹ Finally, this approach, as with the elasticities work, does not measure the possible impact of the project in changing the structure of the local economy – e.g. by affecting the investment decisions of firms.

Inter-Area Comparative Analysis

- 2.26 Some studies have sought to estimate the economic development impacts of road investment by comparing growth in variables such as population, employment and new firm formation in areas where there has been recent road infrastructure investment with figures for “comparable” areas where there has been little or no such investment. This is sometimes done as a straight “area to area” comparison but can be combined with use of the familiar shift-share methodology which seeks to estimate the impacts of industrial structure and sectoral growth trends on an area’s economic performance. Thus if an in which there has been recent investment in roads can be shown to have experienced faster economic growth than would have been predicted on the basis of trends in the wider economy the this “additional” growth may be deemed to be due to the road investment.
- 2.27 The comparison of case study areas with the wider economy or with “control group” comparators may also be used to analyse other indicators of development activity such as the level of planning applications, the volume of house building and commercial or industrial rental levels.

¹ It is noted that some input –output tables are available for sub-areas of Wales e.g. North Wales.

- 2.28 The advantage of this type of analysis is that much of the data required can be available from published sources. Moreover, it is more or less objective. However, despite attempts to control for other factors, there can be no certainty that all such factors have been fully allowed for. Moreover, the analysis does not truly establish a cause and effect relationship but assumes that any “unexplained” growth is due to the road improvements. Nevertheless, this approach can be very useful as “corroborative” evidence which can support or verify the results of other forms of analysis.

CONCLUSIONS

- 2.29 In this section we have reviewed the principal techniques employed in studies which have sought to assess economic impact of road projects. It is evident that – other than the COBA approach – there is no standard methodology employed in studies. As we have seen, the COBA approach provides only a figure for the value of time and cost savings – it does not translate these impacts into effects on employment or the structure of economic activity.
- 2.30 The approaches which have been most widely used in studies of the economic development impact of roads investment fall into three main categories:
- Those which use cost savings estimates (not necessarily derived from any COBA) to predict an impact on output and employment on the basis of estimated or assumed cost/output relationships (the elasticities approach)
 - Those which analyse secondary data on comparative economic performance to attempt to isolate an “infrastructure investment” impact
 - Those which use primary data collection – i.e. surveys – to identify impacts or benefits as perceived or identified by economic agents.
- 2.31 In practice, these approaches all have weaknesses. The elasticities approach has the valuable attribute that it is the approach best suited to *predicting* impacts of specific investment. However, the main weakness is the lack of truly reliable data on the key parameters in the model – relating the time/cost savings created by a new road to the costs of specific business in a particular set of locations requires sweeping assumptions while the reliability of estimates of the elasticity of output with respect to cost for any group of businesses is also open to serious doubt. Finally, this approach deals only with one facet of the economic development impact, that associated with cost savings for existing businesses. Impacts on, for example, business relocation, new starts and inward investment are not considered.

- 2.32 The comparative analysis of economic performance is essentially a technique for assessing the impact of projects after they have occurred – though the results of such work could help inform project appraisals. That aside, a main weakness is the difficulty in statistical analysis of “controlling” for the myriad of other factors impacting on the comparative economic performance of an area. A further problem concerns the availability of data in terms of both time and spatial coverage. The data to undertake the analysis may only become available several years after the project was completed – this is not a technique which provides “early answers”. For some projects the data on indicators such as employment may not be available at the geographical scale at which the impacts occur – i.e. the data may be at too broad a geographical scale for local effects to be discerned.
- 2.33 The limitations of secondary data have often led researchers to rely on primary data – i.e. special surveys. Surveys can yield rich information and can be conducted both before and after an investment project has been implemented. However, they are expensive to conduct if carried out on a large enough scale to provide statistically reliable results. Moreover, securing adequate response rates can be difficult. More generally, the value of this approach is heavily dependant on the nature of the questions asked and the quality of the information obtained by the specific survey. For example, surveys which seek information on business views ahead of any proposed road improvement are open to the suspicion that respondents will exaggerate the benefits of road improvement and over-state the disadvantages of the current situation – partly through lack of knowledge and partly in the hope of influencing investment decisions.
- 2.34 We will consider below the conclusions which can be drawn concerning the most suitable approaches to assessing the economic impact of roads investment but we may note here that reliance on any one technique in all circumstances is unlikely to be appropriate.

3 LITERATURE REVIEW

INTRODUCTION

- 3.1 This section sets out the key results from studies which have examined the wider economic impact of road improvements. The results are set out first under six headings corresponding to the identified mechanisms by which road infrastructure improvements can impact on economic development and activity. These mechanisms are listed below. We also consider the conclusions of other bodies who have reviewed the available evidence on economic impact.

Selection of Studies

- 3.2 A comprehensive search for studies which have sought to assess the economic impacts of specific projects was undertaken with a complete bibliography contained in Appendix A. While some of the studies identified examined the impacts of transport developments at the macro-economic level, the analysis here has focused on those studies which involved empirical analysis of the economic impacts of specific road developments at the local or regional level. It should be noted that in a number of cases more than one study has been undertaken on a specific route. The routes for which studies are reported are:

- M4/Severn Bridge/Second Severn Bridge;
- A55 North Wales Expressway;
- M62 Liverpool to Hull;
- M25 Orbital Road;
- M40 London to Birmingham;
- Skye Bridge;
- Road improvements around Merthyr;
- Fixed Road Connection to Kristiansund; and
- FrenchA71.

- 3.3 From the literature review, it is clear that there are very few cases where assessments of impact made *after* the road was constructed (ex-post studies) have been compared with the results of studies done before the road was built (ex-ante studies). This makes it difficult to draw conclusions about the effectiveness of different methodologies. There is also substantial variation in the geographical area at which impact has been assessed, the methods adopted for analysis and the nature of the impacts assessed.

Impact Mechanisms

- 3.4 As discussed in Section 1, improvements in transport infrastructure can impact on economic activity in a number of ways. The review of literature is set out with reference to assessments made of those impacts. The mechanisms identified were:
- Impacts on transport costs and thus production costs
 - Impacts on labour catchments
 - Impacts on competition in local markets
 - Impacts on inward investment
 - Impacts on organisation of land use
 - Opening up of sites.

LITERATURE REVIEW

Costs of Production

- 3.5 The evidence from the literature is very positive on the impact road improvements may have on production costs. All the studies which incorporated surveys of businesses likely to be affected by the road improvements reported a positive impact from the project. This is unsurprising given that the primary justification for roads projects is usually reduced travel times and costs. Examples of the gains as estimated by businesses are summarised below:
- A study of the Severn Bridge found that while few businesses surveyed found entirely new sources of inputs to be accessible as a result of the construction of the Severn Bridge, firms which already drew supplies from across the estuary increased their sourcing from these suppliers. The main reasons for this being stated to be improved service and more competition which led to lower prices. (Cleary and Thomas, 1973);
 - The potential impact of the Second Severn Crossing was found to be positive for companies in South Wales with 52% of companies responding believing access to

their suppliers would be improved and 59% believing access to their customers would be improved. (Pieda, 1992);

- Almost 30% of businesses surveyed felt that the A55 road improvements had reduced their production costs either through reducing the delivery charge or by new suppliers entering the local market which in turn forced local suppliers to reduce prices. There was no evidence that the catchment area for the businesses output had expanded as a result of the road improvements, but a majority of firms indicated that their delivery costs to customers were lower which had a positive impact on their competitiveness. (Cardiff Business School, 1996);
- There is evidence from the survey of businesses likely to be affected by the completion of the M4 that the road improvements would improve access to their existing markets and provide opportunities for exploiting new markets which in turn would increase business activity. (Welsh Office, 1981).

3.6 While these studies highlighted that businesses are likely to be affected in a positive way by road improvements, the studies did not attempt to quantify the impact of the improved competitiveness on output and employment. Indeed, the study on the Second Severn Crossing noted that transport costs are a small proportion of total production costs and that the improvements in infrastructure can only lead to a slight reduction in transport costs and as very small reduction in overall costs. Hence, it was concluded, "...the overall calculated gains in output to manufacturing are likely to be negligible".

3.7 There are a number of studies which sought to quantify the impact on employment of lower costs of production. These estimates have been produced using the elasticity approach detailed in Section 2 and are based on a series of assumptions concerning the responsiveness of output to changes in transport costs. A summary of the results is provided below:

- **Severn Bridge:** the calculation was based on the assumption that the opening of the Severn Bridge would change South Wales from being a high transport cost location to an average transport cost location. Adopting a series of assumptions (from unspecified sources), the study estimated that employment in indigenous manufacturing businesses in South Wales would increase by 3,800. (Cambridge Economic Consultants, 1987);
- **M62:** adopting a similar approach as that outlined for the Severn Bridge, the study estimated that there would be almost 3,700 additional jobs in indigenous manufacturing in the study area as a result of the construction of the motorway. (Cambridge Economic Consultants, 1987); and
- **A55:** assuming that the road improvements reduced transport costs by 10% and using input – output tables, the study estimated the road improvements would generate an additional 350 jobs. (Cardiff Business School, 1996).

- 3.8 The studies of the impact of road improvements on production costs fall into two broad categories. The first involves surveys of businesses where the impact of the road is usually identified in relatively broad qualitative terms (e.g. access to customers has been improved) and the second studies which have used elasticities or models to quantify the impact on employment.
- 3.9 All of the studies reviewed here were detailed and – so far as can be assessed – conducted carefully and rigorously. However, the results from all of the studies have their limitations. The survey – based studies provided qualitative information on the effect of the infrastructure improvement at a broad level (e.g. for the manufacturing sector) but provided no clear basis for quantifying or valuing impacts. Thus to say that most firms in an area consider that their competitiveness has been improved by a roads investment is interesting but does not indicate how valuable this improvement has been or what the impact will be on growth, employment or incomes. The second group of studies – those based on elasticities of output - do provide quite precise quantified estimates of the impact on employment. However, the concern here is that the accuracy or reliability of the estimates is hard to determine given concerns over the source and validity of the assumptions used in the calculations.

Widening Labour Catchment Areas

- 3.10 The empirical results of the studies of the impact of road improvements on widening the labour catchment area reflect the specific geographical areas and circumstances surrounding each project. A study of the effect of major road investment schemes in Wales (Welsh Office, 1981) found that:
- a minority of firms in South Wales thought that the M4 would extend the labour catchment area of their plant (17% and 18% of large and small manufacturing plants surveyed, and 24% of distribution firms surveyed); and
 - a larger minority of firms in North Wales (35% of manufacturing companies surveyed and 34% of distribution companies surveyed) thought that the A55 improvements could influence travel to work patterns and extend the potential labour catchment areas of their plants.
- 3.11 Of the companies that thought there would be a positive impact on labour catchment areas in the A55 study, 50% were located in an area of relatively low unemployment with an area of higher unemployment located further east. As the road improvements would reduce travelling times between the two areas by 30-40 minutes (which is a very large effect by the standard of most road schemes), companies in the low unemployment area were anticipating an increase in the number of people prepared to travel to their area for employment.

- 3.12 One of the first studies of the Severn Bridge (Cleary and Thomas, 1973) found that the opening of the Bridge had a considerable impact on business travel in terms of salesmen and technical representatives being able to cover both sides of the estuary from one base. However, the impact on commuting and broadening the labour market area was not expected to be significant. The reason for this being that there are no large urban areas in the immediate vicinity of the Bridge and that there were very few industrial plants (and hence job opportunities) within ten miles of the Bridge. The study concluded that the cost of travelling and the time taken were of such magnitude that probably only highly paid executives would consider employment opportunities on the other side of the Bridge. However, it is worth noting that this conclusion reflects the circumstances of thirty years ago and might not apply in a society in which mobility has become far greater with much higher levels of car ownership.
- 3.13 The economic impact study of the Second Severn Crossing (Pieda 1992) found that commuting across the estuary was low and that the benefits of the second crossing were not likely to be sufficient to significantly widen the pool of labour available on either side of the estuary.
- 3.14 A study of the impact of constructing a fixed road link from Kristiansund to mainland Norway found that commuting increased following the road improvements. The study also found that there was considerable centralisation of activity with a number of businesses moving their activity *from* the island to the mainland. This may account for some of the increase in commuting as the location of the jobs had moved, but it also meant that employment in Kristiansund decreased. In the short term, Kristiansund lost jobs – a good example of the “two way effect” by which road improvements can undermine the competitive position of local economies. In the longer term the impacts may be more positive due to lower costs for producer and consumer services and the enlarged labour market.
- 3.15 The studies of labour catchment effects provide reasonably reliable evidence that road improvements can widen the labour catchment area for companies. However, the studies. However, the conclusions concerning the size and significance of the impacts are weak. It appears that the scale and significance of impacts is heavily influenced by local factors such as economic conditions, settlement patterns and land use patterns at either end of the road.

Increased Competition

- 3.16 Reference was made above to the “two way” effect of roads investment in both improving the ability of firms in “remote” areas to access markets and exposing them to increased external competition. None of the studies reviewed above estimated the impact of increased competition separately from the impact of reduced costs of production, although the effect of increased competition is recognised in the many survey responses as lowering prices which in turn reduce production costs.
- 3.17 The study which analysed the socio-economic impact of the Skye Bridge (DTZ Piedad Consulting, 1999) found that businesses in the construction sector working in the local (Skye and Lochalsh) market confirmed that the opening of the Bridge had made it easier for companies based elsewhere in Scotland to access their markets in Skye. These companies assessed the effect on their business performance as negative, but consumers of construction services in Skye should have benefited from the increased competition.
- 3.18 The effect of roads investment in such cases is somewhat analogous to the removal of a tariff or trade barrier. Firms which were protected from outside competition will experience losses but local consumers – and other local firms – will benefit from access to lower cost supplies. If one takes the view that free trade promotes economic development then one would conclude that improving transport access to remote areas also promotes long term development. The available evidence does not allow these effects to be quantified with any confidence.

Impacts on Inward Investment

- 3.19 There are many studies which examine the factors affecting business location decisions. The factors affecting inward investment decisions are likely to be different at different stages in the location decision and for different types of investment decision. There are a number of studies which have examined the locational requirements of inward investors, including both foreign direct investment and mobile UK investment. Two major studies are reported below.
- 3.20 A well known study by Dunning (1988) assessed the locational preferences of international businesses located in the UK. In total, 83 companies, of which 79% were located in the South East of England, were asked to rate the importance of various locational factors on a scale of zero (not important) to four (very important). The study comprised 30 ‘regional’ firms and 53 ‘branch’ firms. A regional firm was defined as one which has a responsibility for a region (e.g. Europe, Far East) of co-ordinating operations of a multi-national enterprise, and a branch firm as one which performs the same role as a regional firm but usually in a smaller geographical area and without a co-ordination role.

- 3.21 For all the 'regional' firms, the single most important location factor was access to airports with a score of 3.5. The other important locational factors for regional firms were language (3.4), market size and prospects (3.1), telephone communications (3) and the general business framework (3). For 'branch' firms, the key locational factors were proximity to clients (3.5), language (3) and market size and prospects (3.2).
- 3.22 A study by Hall et al (1987) surveyed 40 Berkshire companies to determine the critical reasons for their choice of location of the Thames Valley (or eastern part of the M4 corridor). The percentage of firms mentioning the following main factors are:
- Heathrow Airport (75%);
 - M4 motorway (63%);
 - Other motorways and roads (40%);
 - Access to suppliers (40%); and
 - Availability of suitable premises (40%).
- 3.23 These two studies are seminal and rigorous. The information which they produced, while now dated, should be regarded as reliable. However, from the standpoint of roads investment appraisal they are signposts to key issues – e.g. the "middle ranking" importance of roads (other than motorways) to location decisions – rather than sources of usable data.
- 3.24 In addition to studies which examine location decisions in general, a number of roads studies have considered the impact of the road improvement on location decisions in the vicinity of the project. These studies reported that the improvement in road infrastructure can have a positive impact on perceptions of an area, particularly if the area is perceived as being remote and difficult to access (Pieda, 1992) and enhance the attractiveness of the area for development (Cleary and Thomas, 1973).
- 3.25 The M4 study (Welsh Office, 1981) surveyed 18 companies which had opened in Gwent after the M4 had been proposed. Of these respondents, eight (44%) stated that the prospect of access to the motorway network had influenced their choice of location and for three of these companies, this had been a major consideration.
- 3.26 The Second Severn Crossing was found to be a potential major influence on 6% (27 companies) of companies surveyed in terms of their decision to locate or expand in South Wales in the future (Pieda, 1992). Other key locational factors related to the site (price, size, availability of grants), proximity to markets and proximity to former sites.

- 3.27 These studies provide reasonably reliable evidence that roads improvement can influence location decisions for specific businesses – though it is hard to establish the quantitative significance of these impacts or their scale relative to other influences on economic performance.
- 3.28 The study of road improvements around Merthyr (Cardiff Business School, 1997) found some evidence that the most recent inward investors to Merthyr might not have considered the area if the dualling of the A470 had not been completed. Indeed, three companies acknowledged the importance of the road improvements in their decisions to locate in the area.
- 3.29 Cardiff Business School sought to quantify the employment arising from the new inward investment projects round Merthyr. A total of 1,695 direct jobs (in the inward investing companies) and 1,182 indirect jobs (throughout the rest of the economy) were estimated to be supported by six identified inward investment projects in relation to which the study concluded that *"without the supporting infrastructure of roads it is unlikely that Merthyr would have been entered into feasibility studies for these new inward investment projects, with such wider effects on the local economy"*. This study provides quite convincing evidence of impacts of road investment. What is difficult to determine is the wider significance of this evidence – i.e. whether such effects are typical and under what circumstances and for what type of project they are likely to be repeated.
- 3.30 Contrasting results are provided by a study by Thornton (1978) which investigated the success of Bradford in attracting new industry, given that the M606 links the City directly to the M62 which provides motorway links with Manchester and Hull. Five businesses were identified as having established manufacturing plants in the area in the four years prior to the study. None of the companies identified the road network as a key determinant of their locational choice. Roads were deemed to be of secondary importance with the key determinants relating to personal factors, labour factors and land and buildings. All these companies were relocating within Yorkshire.
- 3.31 A more statistical approach based on estimates of *differential* rates of in-movement of firms was taken by Cambridge Economic Consultants (1987). This involved comparing rates of firm in-movement in areas served by new transport infrastructure with rates for "control" or comparator areas. The study estimated that as a result of the construction of the Severn Bridge with its links to the M4, South Wales had attracted between 9,000 and 12,000 jobs in firms not previously located in the region. The same study concluded that 1,500 new manufacturing jobs were attracted to sites along the M62 over a ten year period. As stated, this approach involved analysis of comparative rates of firm in-movement but limited information was provided on the comparator areas.

- 3.32 Taken together, these studies show that transport is an important factor in the location decision process, but by no means the dominant factor. Transport considerations matter more to some projects than to others and it is access to major features of the transport network (e.g. airports and motorways) which is of greatest significance. Studies have attempted to quantify these impacts by analysis of comparative economic performance – though these studies do not prove cause and effect nor do they provide parameter values which can readily be applied in project appraisal.

Re-Organisation of Land Use

- 3.33 Road infrastructure improvements may lead to changes in land use patterns along routes or at junctions. There is extensive literature on the interaction between transport and land use with land use transport interaction models attempting to analyse and forecast the impact of transport change on land use (i.e. location of activities and interactions between activities).
- 3.34 There are a range of different models available (both static and dynamic), but the main weakness is that they are not as strong in representing the behaviour of businesses as they are at representing the behaviour of households. For example, most of the models model businesses in terms of employment by sector and not by firm and given the wide variety of different types of firms in the economy, it is very difficult to model the choices available to firms.
- 3.35 We conclude that these models are of limited use in assessing the impact of infrastructure changes on economic development.

Opening Sites for Development

- 3.36 At the local level, there is relatively widespread and robust evidence that road infrastructure improvements can impact on the development of particular sites.
- 3.37 A case study of the M40 was undertaken by Headicar and Bixby (1992) to examine the development and traffic effects in the immediate vicinity of the motorway. The study found that the motorway created new land divisions by altering the local topography and changed the nature and pattern of accessibility such that certain types of development become feasible (i.e. those requiring large catchment areas such as major shopping centres) and the focus of accessibility shifted from the traditional town centres to the motorway intersections.

3.38 The results of this study appear robust and demonstrate that:

- Development had taken place on land not previously developed and outside the provisions of the approved development plan;
- The nature and intensity of development had been very different from previous development in the vicinity; and
- The development has significant traffic generation factors.

3.39 A number of other studies have also found road improvements to have an impact on retail development. Cardiff Business School (1997) found that the opening of the latest section of the A470 has contributed to the opening up of a new retail development area to the west of Merthyr.

3.40 Gould (1997) investigated planning applications for retail developments in the seven authorities through which the M25 passed (or was in close proximity to). The study concluded that proximity to the M25 was not important for 75% of applications, but for 10% of applications (14) which accounted for 45% of floor space it was regarded as very important. Hence, the M25 has played an important role in enlarging the catchment areas for regional shopping and warehouses.

3.41 Zembri-Mary (1996) examined the impact of the A71 motorway linking the cities of Orleans and Clermont Ferrand via Bourges on real estate transactions through a comparative study of three locations and one control area. The study found that land values rose as a result of the road which was due to the construction process and the zoning of business activities at interchanges and that planning agencies play an important role in effecting the economic consequences of road development.

3.42 We would conclude that there is strong evidence of road improvements opening up new sites for development, although the size and nature of the developments are dependent on the specific project and local economic circumstances. However, this is a topic which should be relatively straightforward to examine using local plans and planning applications.

OTHER REVIEWS

- 3.43 The literature review has identified studies which have considered the general issue of the economic development impact of roads investment. One of the most influential of these studies was that of the Standing Advisory Committee on Trunk Road Assessment (SACTRA) which was published in 1999
- 3.44 The SACTRA report on "Transport and the Economy" concluded that while, in theory, transport cost reductions might be expected to lead to increased economic activity, the empirical evidence relating to such impacts was "weak and disputed". The report stated
- "Some authors have claimed that national programmes of public investment, including road construction, lead to high rates of social return measured in terms of economic growth and productivity improvement. Other authors suggest that such effects do occur but on a smaller scale than has been claimed, and that, in general, any contribution to the sustainable rate of economic growth of a mature economy, with well-developed transport systems, is likely to be modest. Our investigations support the latter assessment. We have also reviewed available evidence from specific local studies seeking to detect economic impacts from completed transport investment projects in the recent past. The state of the art of this important field is poorly developed and the results do not offer convincing general evidence of the size, nature or direction of local economic impacts"* (SACTRA Summary report)
- 3.45 The report also concluded that impacts would be strongly dependant on **local** circumstances – a point which also arises from the present literature review. Further, the report acknowledges that even if the net effects of a transport project at the national level are limited, there may well be effects on the distribution of economic activity and that the impacts on "winners" and losers should be assessed.
- 3.46 The arguments in favour of roads development as a stimulus to economic development have been subject to criticism by environmental groups – notably Friends of the Earth and Greenpeace. A study of the proposals for the Hastings By-passes conducted by CAG Consultants for Friends of the Earth (CAG 2001) argued that the proposed By-passes did not represent the most cost effective or sustainable option for the regeneration of the town.
- 3.47 The CAG report is, however, focused mainly on the consultants' preferred alternative options and contains only limited criticism of the evidence supporting the view that roads are an effective means of promoting economic development. The report criticises the "Access to Hastings" study not so much for its predictions as for its omissions – the study is said not to provide adequate detail in relation to the types of jobs which will be created by development or the extent to which these jobs will be filled by local people. The report also observes that the predictions of the Access to Hastings study depend on a variety of variables and may have proved to be wrong.

- 3.48 The most substantive point in the CAG report is the emphasis on the need to consider alternative options in cases where the primary argument for a project is the economic development impact. Of course, this is less relevant if the project is being advanced primarily on transport grounds with economic development benefits as secondary arguments.
- 3.49 A more general critique is provided by the Greenpeace in a report published in 1994, *Roads, Jobs and the Economy* (Greenpeace 1994). This report reviews a number of studies conducted in the 1970s, 80s and 90s – mainly in the UK but also some in mainland Europe and the USA. The report in many ways presages the SACTRA study – noting that many studies have failed to demonstrate convincingly that particular roads investment has produced economic development gains. That said, the report is arguable selective in its citation of material; for example, the Cleary and Thomas report mentioned above (Cleary and Thomas 1973) is quoted only in relation to negative findings on the effects of the Severn Bridge on relocation.
- 3.50 The Greenpeace report also includes some original research which seeks to test for a relationship between the accessibility of a travel to work area – as measured by travel time to a motorway/dual carriageway, by travel time to the channel tunnel and by travel time to a number of selected destinations – and economic performance as measured by the balance between unemployment and notified job vacancies. The report concluded that no statistical relationship could be found between high accessibility and economic performance.
- 3.51 The Greenpeace report is interesting but of limited relevance to the present work. As stated above, the Greenpeace study raises points addressed later by the SACTRA work. The report correctly emphasises that transport costs are a modest part of overall business costs and that there is no simple relationship between improved access and changes in economic performance. However, the report draws a very strong conclusion “There is no basis in experience or empirical evidence for road investment stimulating economic development” on the basis of very limited data and analysis. Moreover, the report does not discuss how projects should be appraised.

CONCLUSIONS

- 3.52 The review of literature set out here leads to conclusions which are in some ways similar to those of the SACTRA review. In particular, the existing body of evidence is more compatible with the view that transport investments can affect the distribution of economic activity than with the claim that transport investment materially affects growth at the UK level.

- 3.53 The review also concurs with the SACTRA conclusion that the evidence on even regional and local impacts is poorly developed. Individual studies have produced reasonably convincing evidence on the effects of particular projects but it is difficult to draw very general conclusions from the evidence. Moreover, there is little consistency in methodologies used or the quality of the evidence assessed.
- 3.54 Certain broad themes do, however, emerge from the evidence. The following main conclusions are drawn:
- The research evidence suggests that major road improvements do, in practice, reduce production costs in the areas which they serve
 - The evidence on the impact on labour catchments is variable – road improvements can widen the geographical extent of labour markets but the scale and importance of the effect is highly variable and sensitive to local circumstances
 - Only in rare circumstances will roads investment influence the decision of inward investors to locate in a particular region but the quality of transport links can be a potent factor in determining the choice of location within an area by businesses – i.e. it can affect the choice of one town over another
 - At the local level, patterns of property development can be strongly affected by roads investment – this is notably so for major retail developments.

4 CASE STUDY REVIEW

INTRODUCTION

4.1 This section presents the results of Stage 2 of the study in which case studies were undertaken of the impact of road infrastructure improvements along 8 key routes in Wales and Scotland. In terms of economic development, the study considered that pressure may arise in local areas for transport links to:

- Improve access to declining industrial areas;
- Improve access to rural/more peripheral areas to maintain population; and
- Improve access as a response to economic pressures.

4.2 For each of these groups, two types of route were identified - routes which had benefited from road improvements and routes where transport improvements had not taken place. The aim of the case studies was to establish whether there were systematic differences in economic performance between the areas with "improved routes" and those without. The following routes were selected for the Stage 2 analysis to correspond with the three categories of area listed above:

Access to Declining Industrial Areas – Improved Routes:

- A470 from Cardiff to Merthyr Tydfil
- A4042 from Newport to Little Mill

Access to Declining Industrial Areas – Non-Improved Routes:

- A4067 from J45 of the M4 to Brecon
- A4119 Llantrisant to Rhondda Fawr and Fach

Improving Access to Rural/Peripheral Areas – Improved Routes:

- Last sections of the M4/A48 to Carmarthen

Improving Access to Rural /Peripheral Areas – Non-Improved Routes:

- A483 to/from Newtown
- A40 from St Clears to Haverfordwest

Improving Access to Areas of Economic Pressure – Improved Routes:

- M77 from Glasgow to Ayr (A77 between Kilmarnock and Ayr)

Improving Access to Areas of Economic Pressure – Non-Improved Routes:

- A80 from Glasgow to Cumbernauld and Stirling.

METHODOLOGY

- 4.3 The approach to this stage of the study has involved a combination of desk research, consultations and a business survey. A common methodology has been applied to each of the individual routes. The main components of the research are described below. In the case of the A40 Saint Clears to Haverfordwest the case study work was based on data supplied by Berkeley Hanover consultants.
- 4.4 **Desk Research:** Through desk research the key towns along the routes were identified. For data collections purposes, each of these key towns were defined in terms of postcode districts or sectors. The economic performance of these towns and the wider area in which they are located was then analysed.
- 4.5 For routes which have been improved, the time period for the analysis was dependent on the timing of the road improvements. The same time period was then considered for the non-improved routes as the routes were selected on a “paired” basis.
- 4.6 The desk research also included a review of local plans, housing completion data, the Welsh Assembly Government industrial sites register, major retail developments and inward investment.
- 4.7 **Consultations:** During the course of the study consultations were held with a number of organisations to obtain information which is relevant to the analysis and to discuss the role of road investment in economic development.
- 4.8 **Business Survey:** A significant element of the study was a telephone survey of businesses located in the towns which may have been influenced by the road. A total of 182 interviews were undertaken across the selected routes. The questionnaire for the survey covered the following topics:
- Background information and the nature of the business;
 - Locational information;
 - Recent business performance;

- Labour market;
- Customers and markets; and,
- Role of road in company performance.

SUMMARY OF FINDINGS

- 4.9 The results of the case study work are set out in full in a separate volume. Tables 4.1 and 4.2 below provide a summary of the findings. The tables present an assessment of impact against six criteria which are detailed below. Impacts have been assessed in qualitative terms as “definite”, “possible” and “probable” with three dots for definite, two for possible and one for probable. A blank means no impact. Solid dots indicate that the impact is considered to have occurred at the sub-regional level at least – e.g. an increase in employment is an increase in (say) South Wales. Open dots indicate that the impact is local – i.e. the gain is a gain to the town or district but involves displacement from elsewhere in the sub-region. An impact at the sub-regional level can be taken to imply an equal or greater impact at the local level.
- 4.10 Table 4.1 considers the four cases where roads had been improved. In Table 4.2 the results relate to areas where roads have not been improved. Here the scoring system indicates that the *absence* of road improvement is held to be having an impact.
- 4.11 The impact criteria are detailed below.
- 4.12 **Population** For the areas with improved roads population data were examined to establish whether there was any evidence of increased population growth (or reduced decline) following the roads investment. In the case of areas where no road improvement had taken place the analysis considered whether the population trends were more adverse (or more favourable) than in the wider region/nation. It was considered that if, for example, an area where roads had not been improved was experiencing population growth at or above the Wales average then it was unlikely that the absence of roads investment was holding back growth.

- 4.13 Employment** The analysis of employment trends was similar to that for population. For the areas with improved roads data on the level of employment were examined to establish whether there was any evidence of increased employment growth (or reduced decline) following the roads investment. In the case of areas where no road improvement had taken place the analysis considered whether the employment trends were more adverse (or more favourable) than in the wider region/nation. As above, it was considered that if, for example, an area where roads had not been improved was experiencing employment growth at or above the national average then it was unlikely that the absence of roads investment was holding back growth.
- 4.14 Unemployment** Data on unemployment were examined for any evidence of improved trends relative to national pattern in areas with roads investment. Conversely, in areas where roads had not been improved the data were examined for evidence that these areas were experiencing relatively poor performance against this indicator.
- 4.15 Industrial/Commercial Development** Data and market information were collated on levels of industrial and commercial development activity (e.g. of new offices, warehouses and factories) and market conditions in the case study areas. This included information on development of new business parks, take up of existing supply of premises, rent levels and "market interest". The views of agents on factors influencing demand were sought. On the basis of this information, an assessment was made of the impact of the road on demand for and development of business space. Where demand or take up involved some element from inward investors then the impact was regarded as regional. For areas where roads improvement had not taken place the data and market information were assessed to determine whether there was any evidence that development had been held back by the absence of road improvement.
- 4.16 Retail Development** Data and market information were collated on levels of development activity involving retail space (e.g. of new retail parks) and market conditions in the case study areas. This type of development was considered to have an impact at the local level – i.e. causing development to serve the local market to take place in one location rather than another. For areas where roads improvement had not taken place the data and market information were assessed to determine whether there was any evidence that development had been held back by the absence of road improvement.
- 4.17 Housing Development** Data were collected on the development of new sites of housing and on house price trends in general. As with the other forms of property development, the information – including market opinion - was reviewed to consider whether or not evidence existed that housing development had been encouraged by road development or held back by the absence of improvement.

- 4.18 Operational Efficiency of Business** This criterion concerned the impact of roads investment in reducing business costs (or the impact of absence of investment in raising or maintaining costs). The evidence was that provided by the survey of firms. Businesses were asked various questions concerning the quality of transport services and the impact of improvements (or absence of improvements) on operational costs. Where impacts were reported they were considered to be of (at least) sub-regional importance since a cost reduction (or increase) would represent an increase (or reduction) at the national level.
- 4.19 Competition** Businesses were asked in the survey whether roads improvements had increased external competition in local markets. Where roads had not been improved firms were not generally able to comment on the possible effects of poor communication's as a barrier to competition.

RESULTS

- 4.20 Population, Employment and Unemployment** The case studies provided no evidence that the roads projects had a material impact on recorded levels of population, employment or unemployment. This is not to say that there were definitely no effects on the labour market or migration but any such effects would be too limited to make a material impact at the level of aggregate data. In just one case – a road improvement in a declining industrial area – was there evidence that employment trends had improved markedly after the road investment and so it was concluded that there was a possible impact at the sub-regional scale.
- 4.21** In the areas where no road improvement had taken place, trends in population, employment and, to some degree unemployment, remained adverse. The conclusion that the absence of road investment was holding back the recovery of these areas could not, therefore, be rejected. This is, of course, a weak conclusion in that it refers to the absence of a change and states only that one cannot reject the argument that road investment would improve economic trends.
- 4.22** However, if we consider the two sets of cases together, the overall conclusion is that the impacts of road investment of the order involved in the case study projects – the value of which ranged from £50 million to £150 million – were not large enough to be discernible over the level of other factors. In short, the impact of the roads investment was not sufficient to bring about a marked change in the trend of economic performance in the areas. The complexity of the assessment is illustrated by the case of the A4042 – completion of the Newport – Little Mill road improvement was followed by a marked improvement in employment growth in Pontypool but by a relatively slow growth in another town served by the road – Cwmbran.

- 4.23 **Industrial and Commercial Development** There was much clearer evidence that roads investment can have a substantial impact on the development of industrial and commercial sites and thus on the location of economic activity. In two of the four case studies there was considered to be strong evidence that the take up of space on industrial/commercial sites had been substantially affected by road improvements. These impacts were thought to have involved effects on some location decisions at a sub-regional level – i.e. drawing some businesses into the sub-region. In a third case there was thought to be a possible but more limited impact. Only in one case – a road improvement in a rural area – did the evidence suggest that there had been no impact.
- 4.24 The connection between impacts on location decisions or site development and overall economic growth is less clear given the evidence, reported above, on the absence of impact on measured levels of employment. It is, however, worth noting that there was a marked improvement in the employment growth trend in the Pontypool area – which encompasses business parks sites whose development has been encouraged by the roads investment. That said, the impact of this type of development is generally too limited to be detectable in aggregate data.
- 4.25 The review of unimproved routes also supported the view that roads investment impacts on site development and property demand. In two of the corridors, the poor quality of road links was cited as an explanatory factor in accounting for lack of demand for sites and, indeed, inability to attract mobile investment. This “lost” demand or development was considered to be lost to other parts of Wales (or Scotland in the case of the A80).



Table 4.1
Case Studies – Assessment of Impact of Roads Development

	Population	Employment	Unemployment	Industrial/ Commercial Development	Retail Development	Housing Development	Operational Efficiency of Businesses	Competition in local area
Declining Industrial								
A470				○	○○○		●●●	
A4042		●		●●●	○○○	○○○	●●●	
Rural/Peripheral								
M4/A48					○	○	●●●	○○○
Area of Economic Pressure								
M77				●●	○○○	○○○	●●●	●●
	Sub-Regional			Local				
Definite Impact:	●●●			○○○				
Probable Impact:	●●			○○				
Possible Impact:	●			○				



Table 4.2
Case Studies – Assessment of Impact of Absence of Roads Development

	Population	Employment	Unemployment	Industrial/ Commercial Development	Retail Development	Housing Development	Operational Efficiency of Businesses	Competition in local area
Declining Industrial								
A4067	○	●	●	●●	○○○	○○○		
A4119				○○○	○○○	○○○		
Rural/Peripheral								
A483	○	○○	○	○			●	
A40							●●●	
Area of Economic Pressure								
A80	○○○	○○○		●●●	○○○	○	●	
		Sub-Regional		Local				
Definite Impact:		●●●		○○○				
Probable Impact:		●●		○○				
Possible Impact:		●		○				

- 4.26 **Retail** The evidence of effects on retail development was particularly strong – except in the case of the rural area. In the other cases, route improvements had been followed by new retail park developments at or near key junctions. In contrast, there was a notable lack of new “out of town” retail development along the unimproved routes and a reported lack of developer interest.
- 4.27 Retail development is, of course, based on “local” demand and expenditure. It follows that growth in retail activity and employment in one area will largely displace activity elsewhere in the sub-region. It follows that the economic impacts created through effects on retail development are essentially local in character.
- 4.28 **Housing** The case studies also provided strong evidence that housing development is affected by roads improvement and investment. In three of the cases where roads had been improved there was evidence, in two cases very strong evidence, that house building rates had increased on sites near the road following the road improvements. In some cases this outcome was supported by planning policy decisions to make land available on sites near the road.
- 4.29 In two of the five cases of unimproved routes, there was a notable lack of new housing development which contrasted with higher levels of activity in more accessible locations with the wider area. Again, these effects largely involve “shifting” housing demand and thus population within the sub-region or local area. Stimulating development of housing can boost the growth of particular communities or towns but will not have a material effect on sub-regional growth.
- 4.30 **Operational Efficiency of Businesses** The impacts of roads investment (or its absence) were explored through the survey of businesses. Firms in areas where roads had been improved were asked questions about the quality of transport links and whether the investment had led to reduced journey times/costs, better access to suppliers and customers, better access to labour and had benefited the business. In all cases where the roads had been improved a high proportion of firms reported benefits to the business through improvements to journey times and costs – specific benefits cited varied but included faster business trips, easier movement of goods and improved access to customers/suppliers. Impacts on labour recruitment were reported to be very ,limited.

- 4.31 These results are, in a sense, re-assuring in that the main direct objective of transport investment is to reduce travel costs (in the broad sense – including time). The Cost Benefit methodology explained above counts as principal benefits of roads investment the reduction journey times and costs. It is sometimes argued by critics of the CBA procedure that the estimated benefits of some projects involve very small time savings for very large numbers of users and that these time savings may fall below some threshold of perception or significance for individual users. The survey results suggest that time and cost savings are typically tangible and significant for businesses. Moreover, as these cost savings reduce the overall cost of production, they are benefits at the national level.
- 4.32 In three of the five unimproved route areas firms felt that their costs were to some degree increased by the poor quality of the road links. This point was expressed most strongly in the rural area of west Wales.
- 4.33 However, while the time and cost savings are real, there is nothing in the evidence to suggest that these benefits are over and above those accounted for in the CBA procedure.
- 4.34 **Competition** Transport improvements represent, literally, a two way road so far as economic opportunity is concerned. Improved access may increase the capacity of “outside” businesses to serve a particular market – some evidence of this was reported in the literature review. The survey provided only limited evidence on this point. It may be significant that one area in which there was a strong belief that outside competition had increased was in the rural area around Carmarthen. It seems plausible that road improvements in rural areas **could** have greater impacts on accessibility than in the context of a develop urban transport system.

CONCLUSIONS

- 4.35 The case studies, taken together, suggest that road transport investment – or the lack of investment – can have clear impacts on the location of economic activity and of population. The work has afforded convincing examples of investment in industrial, commercial, retail and housing development being influenced by new roads investment or being held back by the lack of such investment. Among the South Wales valleys there is a detectable difference in levels of commercial and residential development between those valleys with improved roads and those without.
- 4.36 It is also the case that the take up of existing sites and premises – and thus the location of businesses – can be affected by the quality of the roads network. It follows that levels of employment (and population) within particular areas will also be affected. However, the scale of impact in the projects examined has not been sufficient to produce changes which are discernible in published data on employment and population. One explanation is that, for these projects at least, the impact is sufficiently modest to be “masked” or outweighed by other factors.
- 4.37 The case studies also lead, however, to the conclusion that impacts are mainly local rather than regional or national. That is to say, the effect of the projects was to cause investment and development to take place in one part of a sub-region (e.g. one part of South Wales) rather than another. Where effects are very localised, e.g. development is shifted from one part of a district to another, they will not show up in economic statistics at the district level and above.

5 CONCLUSIONS AND RECOMMENDATIONS

INTRODUCTION

5.1 The conclusions set out below are derived from the work of the study as a whole – that is they take full account of the literature survey work as well as of the case study work. The conclusions are considered in terms of the main impact mechanisms identified earlier in the report before issues related to the development of appraisal are discussed.

5.2 The impact mechanisms discussed are:

- Impacts on transport costs and thus production costs
- Impacts on labour markets
- Impacts on business property development and business locations (including inward investment)
- Impacts on retailing
- Impacts on housing development
- Impacts on competition in local markets

PRODUCTION COSTS

5.3 The literature review evidence leads to the clear conclusion that transport improvements can and do reduce the costs of businesses in areas served by improved routes. The same conclusion is supported by the evidence of the survey work conducted in the case studies. It is generally accepted that these cost reductions are reflected in the CBA methodology and thus that there is no need to measure them separately as an additional item.

5.4 However, it was argued above that in the appraisal of transport projects in an economic development context we are as concerned with assessing the actual scale and pattern of economic change “on the ground” as with being weighing costs and benefits. That is to say, we may well wish to know how what the effects of a cost reduction will be on the pattern and level of employment. This information is not produced by the CBA analysis and thus some form of supplementary analysis is concerned.

- 5.5 The literature review discussed the approaches used to translate cost reductions into estimated increases in output and employment. These were based on estimated elasticities of output with respect to cost and, of course, require that the transport cost reductions can be estimated in the first place. Cost reductions could, in principle, be estimated from the output of transport models.
- 5.6 It should, however, be said that many calculations of this type use quite sweeping or very broad estimates of the relevant parameters and the calculations are subject to a high degree of error.

IMPACTS ON LABOUR MARKETS

- 5.7 The evidence from the literature suggests that road improvements can widen the labour catchment area for companies, but the size and significance of the impact is very much determined by local factors such as economic conditions and geographical/land use patterns at either end of the road.
- 5.8 The survey work did not produce strong evidence of labour market effects and few firms considered that road investment made a great deal of difference in one direction or another.
- 5.9 We conclude that labour market impacts can occur but that no general conclusions can be drawn concerning their prevalence.

IMPACTS ON BUSINESS PROPERTY DEVELOPMENT AND LOCATION

- 5.10 The case study work revealed strong evidence of road investment impacting on the decisions of investors to develop industrial and commercial sites. Since such development depends for its success on demand from businesses, it is safe to conclude that the location decisions of firms are also influenced. The literature review also supported this conclusion.
- 5.11 The effect of road investment is bound up with the issue of the impact of property provision on location. The critical issue is whether the provision of "better," more accessible sites affects locational choices within areas or between large geographical units such as regions. While effects on the development potential and marketability of sites **can** be significant enough to affect economic activity at the sub-regional (e.g. drawing businesses into one part of South Wales rather than another, we consider that effects at a regional level are much rarer. Moreover, in many cases one is affecting only the choice between one town and another.

- 5.12 If, as will often be the case, new development is diverting demand from one part of a travel to work area from another then no effects will be discernible at the level of that statistical unit.
- 5.13 Except then in exceptional cases – where it can clearly be demonstrated that roads investment is creating an opportunity to provide a business location or locations which will be competing principally with locations in other regions or countries – the effect of road investment on site development and location will sub-regional in character. Examples of such an exceptional case are, arguably, the extension of the M4 into Gwent 20 years ago and the construction of the first Severn Bridge. Otherwise, the investment may increase development in one town or part of a sub-region but is unlikely to have any net effect at, say, the level of Wales or South Wales.

RETAILING

- 5.14 The literature review and the case studies both provide convincing evidence that roads investment is a powerful factor in the spatial development of retailing. Out of town centres in particular tend to develop to exploit accessibility created by extensions and improvement of the road network. Of course, the principal economic effect of such development is to redistribute economic activity within a fairly limited geographical area.

HOUSING

- 5.15 Similar conclusions apply to housing as to retailing. There is a long and well understood history of transport developments (e.g. suburban railways) affecting the spatial pattern of housing investment by developers. These effects come mainly through impacts on potential journeys to work. The cases studies demonstrated this effect. Where road investment *increases* to a significant degree the accessibility of communities to main employment centres, the potential for a stimulus to the housing market and to housing development is generally strong.

IMPACTS ON COMPETITION

- 5.16 The literature review provided only limited evidence of the, theoretically important, impacts of improved accessibility on the level of competition – and thus prices for goods and services – in affected areas. In the case studies, the issue did emerge in one case. We conclude that impacts on competition are only likely to be important in markets where existing competition is limited and where the road investment is such as to bring about a significant increase in accessibility. It is difficult to give a quantitative definition to “significant” in this context – what is a significant journey time saving in travelling round a town is not significant to a long distance journey. We can, however, say that a significant effect is one which represents a step change in accessibility and is large enough to affect decisions as to whether or not to undertake a journey. The evidence of traffic modelling may be relevant in making this assessment.. Significant impacts are likely to arise in the case of major investments linking to remote/rural areas or overcoming physical barriers (e.g. the Skye Bridge).

OVERALL CONCLUSIONS

- 5.17 The existing literature and the case studies point to the complexity and variety which exists in the impact of specific transport investments. This creates problems for generalisation. However, we consider that the following general conclusions can be drawn from the evidence:
- Roads investment do generally produce time and cost savings for businesses – as implied by transport models and Cost Benefit analysis
 - These effects, although real, are not typically large enough to affect business performance to a degree which would be discernible in aggregate economic data at the level of local authority areas far less regions
 - Very large scale transport projects – e.g. the construction of a new motorway – can profoundly affect location choices made by business but such cases are highly exceptional
 - The most important or common mechanism by which roads investment affects the distribution of economic activity is through impacts on the development and marketing of business sites – this can be potent at affecting economic activity levels at a very local scale (e.g. in a town) but the net effect at the sub-regional level will usually be minor or negligible
 - Roads investment can have a powerful impact on the location of retail and housing investment – although this will not impact on the level of regional economic growth, it can be important to local area regeneration

- The economic impact of road investment is determined by the existence of economic potential which can be realised by improving accessibility – improving access to areas where there is little economic activity or very limited market opportunities is unlikely to have much economic impact.
- In the context of developed economies, the economic development impact of roads investment will generally be local in character – benefiting specific towns or localities – and thus should be seen as a support to local area regeneration more than regional development.

DEVELOPING APPRAISAL PROCEDURES

- 5.18 Finally, we consider what implications for appraisal of roads investment follow from the above conclusions. The argument that the net economic impact of roads investment at a UK level is “captured” by the cost benefit techniques (though not necessarily by every individual use of the COBA model) is generally valid. We do not consider that the UK level case for individual projects is likely to be altered by analysis of wider UK economic impacts.
- 5.19 However, roads investment may be promoted as a means of addressing sub-regional or local regeneration priorities. Thus impacts at the regional or local level in certain areas may be counted as net benefits in the analysis even if matched by reductions in economic activity elsewhere. Thus, it may be concluded that a particular investment – which does not “pass” on national transport efficiency grounds – may be warranted because it serves the “social” aim of regenerating a particular community.
- 5.20 This general principle is reflected in emerging government guidance. Following the publication of the SACTRA report in 1999, the Department for Transport produced a “Government Response”. In its response, the Department indicated that new guidance would be issued on assessment of economic impacts and that the main focus of such guidance would be on the effects of transport investment in offsetting *labour market* imperfections (i.e. localised unemployment) and on regeneration effects of transport investment.
- 5.21 Further to this, the government has commissioned consultants to undertake research into the development of an “Economic Impact Report” to be included in appraisals. The Draft Stage 1 report has been published (Steer Davies and Gleave 2001). The report reaches conclusions which are similar to those of this report – notably in terms of the absence of any agreed set of procedures (from the UK or overseas) which could simply be adopted, and in terms of the “mechanisms” of impact. The report does not constitute a detailed or full guidance but sets out most of the relevant concepts and, to use its own terms, “building blocks”.

- 5.22 To develop the appraisal techniques for transport projects, the Scottish Executive has developed Scottish Transport Appraisal Guidance (STAG). In common with the thrust of the other work arising from SACTRA, this framework recognises two dimensions of impact:
- Transport Economic Efficiency (TEE) covers the impacts usually covered by standard cost-benefit analysis; and
 - Economic Activity and Location Impacts (EALIs) which allows projects to be expressed in terms of their effects on the local or national economy.
- 5.23 EALIs are measured in terms of changes in GDP and employment and in many instances they will simply restate the TEE impacts using different measures of impact, though where there are market failures, the TEE may fail to capture all the economic impacts of a scheme.
- 5.24 EALIs must be presented at the national level and they should include both positive and negative impacts associated with the project including displacement. Local impacts (both positive and negative) should also be included, particularly if the project impacts on areas where funds are being targeted for the purpose of regeneration. Again, the EALI provides a route for “justifying” a project in terms of regeneration effects.
- 5.25 There is, as yet, no clear template to follow in terms of assessing wider economic impacts, although we believe that STAG, along with the Economic Impact Report work mentioned above, provides a useful framework. In particular, the appraisal process should be able to address the following issues:
- What will the transport proposal achieve in terms of transport costs and benefits?
 - Who will benefit and who will lose from the project?
 - Where are the winners and losers located and what is their economic role?
 - What are the likely responses of the winners and losers in terms of their travel and economic behaviour?

- 5.26 Assessment of economic benefits “outside” the CBA framework should, therefore, be focussed on **local** level impacts. Moreover, we consider that the main focus of such appraisal should not be impacts at the firm level but on effects through the property market – i.e. expected impacts on the level of provision of business, retail and residential property. The implications for the distribution of economic activity can then be assessed by placing this analysis within the wider property market context – e.g., from where will demand be diverted, what are the competing locations? Explicit weight should be given to impacts which benefit priority areas – e.g. Objective 1 areas in Wales.

Appendix A:
Bibliography

BIBLIOGRAPHY

Bryan J, Munday M, Welsh Economy Research Unit, "Turning the Corner? Road Improvements and Economic Development in Merthyr", 1997

Bannister D, Berechman J, "Transport Investment and Economic Development", 2000

CAG Consultants, "New Jobs without New Roads" Friends of the Earth 2001

Cameron G, Muellbauer J, "The Housing Market and Regional Commuting and Migration Choices", Centre for Economic Policy Research, 1998

Centre for Economics and Business Research Ltd, "Roads and Jobs: The Economic Impact of Different Levels of Expenditure on the Roads Programme", Summary, 1994

Cleary E. J, Thomas R. E, "The Economic Consequences of the Severn Bridge and its Associated Motorways", Bath University Press, 1973

Department of the Environment, Transport and the Regions, "Guidance of the Methodology for Multi-Modal Studies", Volume 1, 2000

Department of the Environment, Transport and the Regions, "Guidance of the Methodology for Multi-Modal Studies, Volume 2, 2000

Department of Transport, Department of the Environment, "A New Approach to Trunk Road Planning", 1997

Department of Transport; Department of the Environment, "A New Approach to Trunk Road Planning", 1997

Ernst and Young, "Transport Infrastructure, Business Costs and Business Location",

Faber Maunsell, "The Draft Regional Transport Strategy for the North East", Consultation Summary, 2002

Greenpeace "Roads, Jobs and the Economy" 1994

Halden D, Sharman K, "A Study of Transport and Development Changes Around Inverness", Transport Research Laboratory, 1994

Headicar P, Bixby B, "Concrete and Tyres: Local Development Effects of Major Roads M40 Case Study", Council for the Protection of England, 1992

Jubilee Line Extension Impact Study Unit, "The Concepts and Methodological Framework for Assessing the Impacts of the JLE", Working Paper No. 4.

Mackie PJ, Tweddle G, Institute for Transport Studies, "Measuring the Benefits Gained by Industry from Road Network Improvements", ITS Working Paper 391, 1993

McQuaid R, Greig M, Employment Research Institute and Transport Research Institute, Napier University, "Transport and the Scottish Economy: Key Issues", 2002

Nakamura H, "The Economic Evaluation of Transport Infrastructure: Needs for International Comparisons", Institute for Transport Policy Studies (www.elsevier.com/locate/tranpol)

National Assembly for Wales, "Welsh North-South Transport Links Study: Transport Strategy – Executive Summary", 2000

Newbery D, "Efficiency Benefits of Transport Cost Reductions", Department of Applied Economics (Cambridge), Executive Summary, 1998

Newbery D, "Measuring the Indirect Benefits of Transport Cost Reductions", Department of Applied Economics (Cambridge), 1998

OECD, "Impact of Transport: Infrastructure Investment on Regional Development",

Parkinson M, Department of Transport, "The Effect of Road Investment on Economic Development in the UK", Working Paper No 43, 1981

Robson B et al, "Regions in Partnership: the Trans-Pennine Corridor Study", 1995

Scottish Executive Development Department, "Travel Choices for Scotland: Strategic Roads Review", volumes 1 and 2, 1999

Steer, Davis and Gleave "Research into Guidance on the Economic Impact Report: Draft" DTLR 2001

Steininger Karl W, "Transport, Access and Economic Growth", World Economics, Volume 3 No. 2, April-June 2002

Transport and Economic Development, "Report on STSG Dundee Conference, 1 October 1999"

University of Leeds Institute for Transport Studies, University of Manchester Department of Planning and Landscape, University of Manchester Centre for Urban Policy Studies, "Regions in Partnership: The Trans-Pennine Corridor Study", 1995

Welsh Assembly Government, "Review of Trunk Roads", 2002

Welsh Assembly Government, "Trunk Road Forward Programme", 2002

Welsh Office, "Transporting Wales into the Future", 1998

Whitelegg J, "Roads, Jobs and the Economy", 1994