South Essex Rapid Transit
Major Scheme Business Case

Appendix 4J
Wider Impacts

April 2010

Essex County Council

THURROCK COUNCIL

southend onsea BOROUGH COUNCIL

INTERREG IVB

BOOSTING ADVANCED PUBLIC TRANSPORT SYSTEMS

A partnership project between Essex County Council, Southend-on-Sea Borough Council and Thurrock Council

1 Wider Impacts

1.1 Transport appraisal is a relatively mature discipline. For some 40 years transport professionals have been using economic and modelling techniques to estimate the contribution of transport schemes to society.

1.2 The current UK appraisal framework is based on the Department for Transport's 'New Approach to Transport Appraisal', or NATA. This framework aims to capture the full set of benefits that society derives from a scheme under five objectives; the Economy, Environment, Safety, Integration and Accessibility.

1.3 The main component of the appraisal framework is the economic assessment. Ideally this should measure what we may call final impacts. These include changes to real output, wages and consumer prices, as well as non-market impacts such as on non-work time savings and safety. For instance, reducing the time it takes for an accountant to reach clients will mean increased productivity as less time is 'wasted' travelling. As a result the accounting firm may increase wages, cut prices, increase output and/or increase its profits. These impacts will have yet another round of impacts on the firm's employees, clients and owners. Hence, the real economic benefits are the final impacts after the initial effects have 'rippled' through the economy.

1.4 Accurately tracing these indirect impacts of a scheme as they work through the economy is, however, a very complex task. Transport appraisal therefore only seeks to measure the direct or first round economic impacts e.g., the time and cost savings to users. Given certain assumptions, crucially the existence of perfect competition in all markets, this assumption is valid. The direct benefits neither magnify nor diminish as they pass through the economy. So the sum of the increase in wage, the reduction in price and any increased profit margin should be exactly identical to the value of the time initially saved by the accountant.

1.5 However, over recent years there has been a growing recognition that transport appraisal does not represent well enough the impacts schemes have on the wider economy. Firstly, concerns have been growing that the appraisal assumption of perfect competition is too strict. A significant amount of literature over the last years has addressed the potential for transport to deliver wider impacts - that is, additional benefits on the wider economy beyond the direct impacts. The view is that current approach to appraisal fails to capture these impacts.

1.6 These additional benefits may arise where market failures cause the direct transport impacts to be magnified as they pass through the economy. New guidance from the Department for Transport (DfT)[1] enables the quantification of Wider Impacts (WIs) caused by agglomeration economies, imperfect competition and labour market inefficiencies. These have been found to typically add between 5% and 40% to the conventionally measured appraisal benefits.

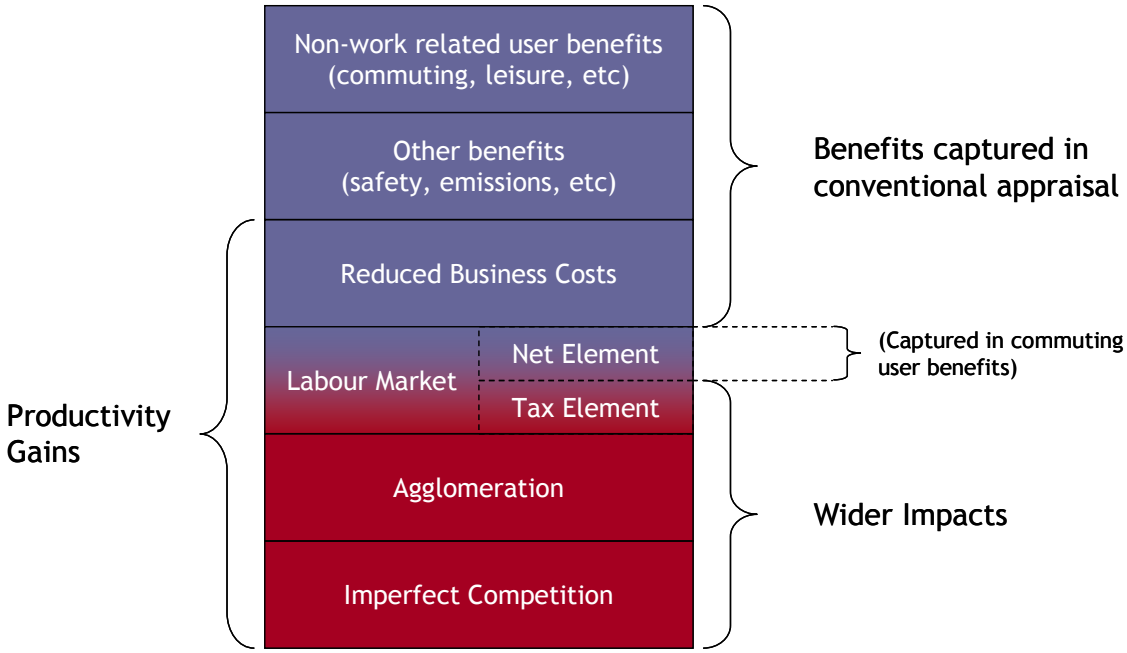
---

[1]TAG Unit 2.8 "Wider Impacts and Regeneration", Department for Transport, 2009.

1.7 Secondly, cost-benefit assessments often do not express benefits from transport improvements in terms that are relevant for many stakeholders. Travel time reductions and cost savings are all important, but scheme promoters invariably have other objectives – for instance in terms of accessibility, jobs, employment and productivity.

1.8 To understand the full set of economic impacts of transport schemes, additional analyses beyond the conventional Cost-Benefit Analysis (CBA) are therefore needed. Figure 1 below seeks to illustrate the sources of and relationship between conventional appraisal benefits, wider impacts and productivity impacts. Each of the wider impacts identified by the DfT's guidance are explained briefly, in turn.

FIGURE 1 RELATIONSHIP BETWEEN CONVENTIONALLY MEASURED BENEFITS, WIDER IMPACTS AND PRODUCTIVITY GAINS



Agglomeration Impact

1.9 Agglomeration simply means the geographic clustering of firms and workers. Cities are one type of agglomeration. In cities we often find that wages, rents, transport costs and other prices are higher than elsewhere. The explanation for the desire to locate in cities despite the additional costs must be that firms in a wide range of economic sectors are more productive when they are clustered.

1.10 Typically, firms are more productive when near to other firms because they have access to a large variety of inputs to their activities. It is also often argued that proximity to other similar firms increases the chance of acquiring new knowledge and of building connections and networks which support or increase productivity. Research shows, for instance, that face to face contact is very important in some type of business environments.

1.11 Many firms are also more productive when they have access to a large labour market, since this makes recruitment quicker and it is easier to find workers with the exact skills match that they are after. Evidence supports all of this by

showing that, as a city grows and becomes denser, its firms become more productive.

1.12 When we talk about density of a city, we really mean the number of firms or workers that are accessible. Rather than number of jobs or worker per square km, it is more natural to consider the number of jobs or workers located within, say, X generalised minutes. Because the effective density depends on perceived distance, the role of transport in supporting accessibility, and therefore agglomeration, is important. If transport is made cheaper or quicker, more firms and workers will be located within reach and, according to the literature on agglomeration, productivity will increase. Importantly, these agglomeration benefits are additional to those already captured in appraisal.

Time and cost savings to travel in the course of work

1.13 This element of appraisal is based on the assumption that travel in the course of work is usually not productive in itself and reducing journey times frees up time for additional productive activity. When an individual saves one hour travelling whilst in work, the appraisal values this time at the gross cost to the firm of the worker's time (i.e. hourly wages plus national insurance contributions and other labour related costs). Identifying the productivity gains from business cost savings is therefore simple – they are identical to the business impacts as identified in the conventional transport appraisal.

Imperfect Competition

1.14 Despite the above, what we really seek to measure by time savings in the course of work is the additional value to society of the additional activity the worker now can undertake instead of travelling. However, under the assumption of perfect competition these two values (hourly labour cost and marginal hourly productivity) are identical - so labour costs is a good approximation.

1.15 In reality this is not true. On average firms are able to charge more for their products and services than what they cost to produce. This means that the value society places on the worker's output from one hours' additional work (i.e. the price of whatever the worker makes in one hour) is higher than the cost of the workers' time to the firm.

1.16 By valuing workers' saved time at the level of costs to the firm rather than the value to society, current transport appraisal underestimates the benefits of in-work travel time savings.

Labour market impacts

Productivity gains of commuting cost reductions

1.17 When individuals make decisions about labour supply, e.g. whether to work, how much to work and where to work, they take many factors into account. Importantly they balance the financial gains (i.e. 'take-home wage') against what we may call personal costs (i.e. giving up spare time). If the financial returns to work increase or the personal costs decrease, more individuals are likely to choose to work, whilst some of those who already do will decide to work more or in more productive (and more demanding) jobs. The result is increased productivity (as measured by output per capita).

1.18 The monetary costs of travelling to work reduce the financial gains from working, whilst commuting time costs increase the personal costs. The time and cost of commuting are therefore deterrence to productivity. We can measure the productivity impacts of changing commuting costs by assessing the resulting employment changes:

- 'More people working' is assessed using evidence on labour supply responses to changing wages;
- 'More people working in more productive jobs' can be assessed using land use transport interaction (LUTI) models or by a simpler approach treating model forecasts of travel to work as proxy for employment.

1.19 Note that this effect is distinct from any impact that a scheme may have on the rate of unemployment.

Wider welfare gains of commuting cost reductions

1.20 Transport appraisal counts the welfare benefits of commuting time savings by measuring individuals' willingness to pay for them. For those individuals who now decide to work or to work longer, their welfare benefits will be lower than the productivity gains. This is because welfare gains are net of the increased personal costs of giving up spare time. As an example, consider an individual who could earn £1000 by starting to work, but would incur commuting costs (including time) of £110 to do so. Starting work would also mean giving up spare time, which the individual values at £900. This individual would be £10 better off by not working (£900 vs. £1000 - £110 = £890) and would therefore decide not to work. Should commuting costs fall by £20, the situation is reversed; the individual would now be £10 better off by working (£900 vs. £1000 - £90 = £910). The personal impact on the individual of the reduction in commuting costs is £10 (£910 - £900).

1.21 We here see an illustration of the important distinction between welfare impacts and productivity impacts. The welfare impact is simply £10, whilst output will increase by much more. The two units of accounts measure two different things and transport appraisal concentrates on counting welfare.

1.22 But there is another reason why the individual's willingness to pay for commuting time savings is lower than the productivity gains, which is not taken account of in appraisal. Because of labour related taxation (income tax, national insurance contributions, etc), the return to the worker as a result of extra effort (i.e. net wage) is lower than the value to society (i.e. gross wage). For this reason, where individuals change labour market decisions because of a transport scheme, the consequent tax changes are additional to the benefits currently captured in appraisal.

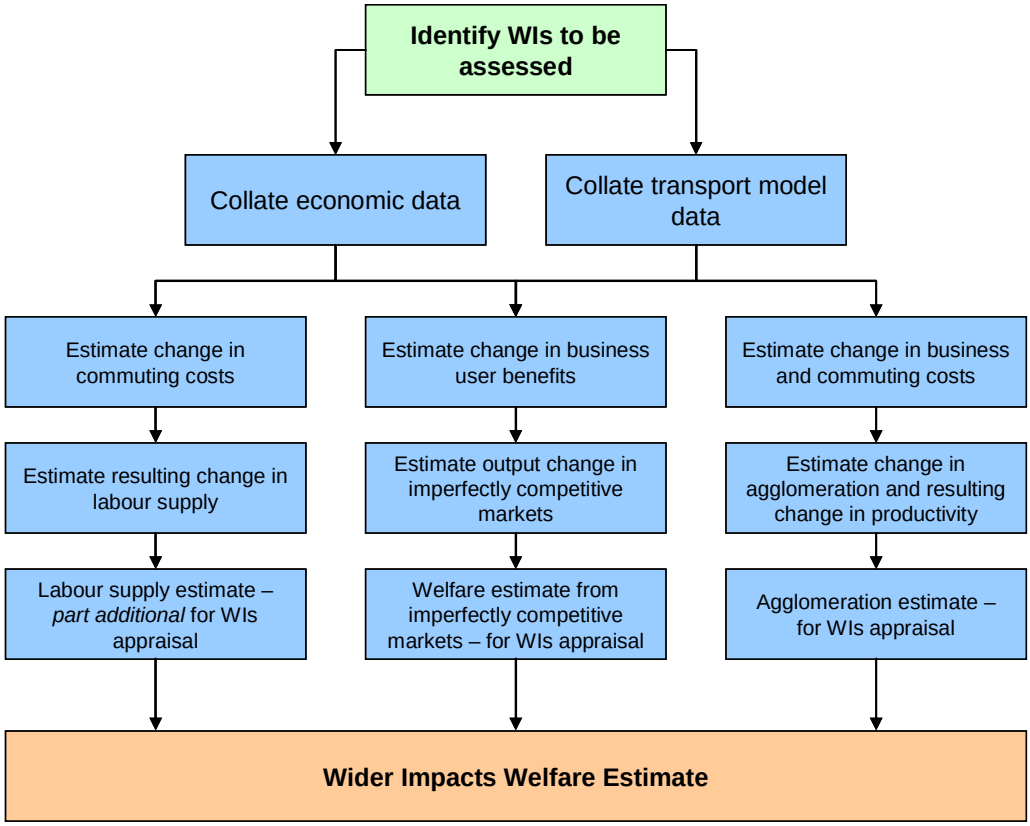
1.23 Returning to the example, say the worker would produce output worth £1500, although the net salary is only £1000. The £500 difference, or tax-wedge, is a benefit to society that is currently not captured in appraisal. If we can identify a £1500 increase in productivity because of labour market impacts, we can therefore add £500 to the benefits identified by conventional appraisal.

1.24 Evidence supplied by DfT's guidance suggests that this tax wedge amounts to about 30% to 40% of labour market productivity gains.

Methodology and Results

1.25 The framework presented by the DfT's guidance aids the quantification of a set of benefits that are additional to what is currently captured in transport appraisal, as well as enables the expression of transport impacts in terms of productivity. Figure 2 below shows some of the key steps in estimating Wider Impacts (WIs).

FIGURE 2 THE PROCESS OF ESTIMATING WIDER IMPACTS



Source: TAG Unit 2.8 "Wider Impacts and Regeneration", Department for Transport, 2009

1.26 For the sert scheme, three types of Wider Impacts were identified for assessment:

- Agglomeration;
- Imperfectly competitive markets; and
- Labour supply.

1.27 The second stage of the analysis relates to the collation of appropriate data inputs. The Wider Impacts appraisal builds on modelled estimates of travel time and cost savings to different users of the transport scheme. The following data was used as inputs for the WIs estimation:

- Transport Model data from the TUBA model: generalised cost and travel demand information for different users (business, commuting and other) and different modes (PT and highway) in both scenarios (Do Minimum and Do Something);
- Economic data: this includes data on the productivity of labour, on employment numbers in an area, and on the likely productivity impacts that results from changes in the level of agglomeration.

1.28 The transport data requirements for the WIs analysis can be more demanding than the requirements for conventional transport user impacts, as this analysis is assessing the contribution of the scheme to the overall existing levels of accessibility and agglomeration and not just the impacts on the elements of travel that are changed as a result of the intervention. The WIs appraisal ideally needs to consider all flows by all modes and by all journey purposes in the area considered. In particular, the agglomeration calculations depends on modelling a larger enough region to set the journeys affected by the scheme in the context with all other significant journeys that aren't affected by the scheme: considering too small an area will tend to exaggerate the agglomeration impact of proposals.

1.29 Data for the whole of Great Britain was obtained and the transport model data was aggregated. The study area considered to evaluate the WIs for the sert scheme was limited to southern Essex and the Unitary Authorities of Thurrock and Southend-on-Sea.

1.30 After the appropriate data was collated, the WIs could be estimated.

1.31 The agglomeration (WI1) estimation was undertaken as follows:

- Change in the level of agglomeration resulting from the transport scheme: impact that the change in user travel time and costs has on accessibility of firms and workers to each other;
- Productivity impact: estimated by applying a value to reflect the likely change in productivity for each fractional change in agglomeration.

1.32 The output change in imperfectly competitive markets impact (WI2) represents the difference between the (higher) willingness to pay for increased output and the (lower) cost of extra production, in imperfectly competitive markets. It can be shown that these 'missing' benefits equal about 10% of conventionally measured user benefits to freight and business travel.

1.33 The labour supply impact (WI3) is estimated in several parts:

- Change in the net benefit from working: change in modelled commuting costs resulting from the scheme affects the benefit that individuals obtain from working;
- Change in the level of labour supplied - calculated by applying an evidence-based elasticity value to the net wage change;
- Additional productivity that results from the additional labour supplied - determined by multiplying the change in number of people working by the average economic contribution (GDP) of a new worker.

1.34 Experience to date is that agglomeration is usually the largest WI.

Transport Model Data

1.35 The modelled demand for the proposed scheme, based on the outputs of these models, was calculated for the future year of 2028, which is sufficiently distant to allow the proposals to reach 'mature levels' of demand.

1.36 The demand was also modelled for the AM peak, inter-peak (IP) and PM peak period and annualisation factors are used to derive annual forecasts from the modelled hours. The annualisation factors employed in this appraisal are derived

from recent modelling exercises. Based on these, the annualisation factors for the AM peak hour, inter-peak hour and PM peak hour have been estimated at 930, 1860 and 930 respectively (3x310, 6x310, 3x310).

Results

1.37 Table 1 summarises the conventional and wider impacts from the sert scheme in 2028. The conventional user benefits of £ 11.8m in 2028 are the total benefits from the conventional appraisal TEE table.

TABLE 1-1 WIDER IMPACTS AND PRODUCTIVITY GAINS FROM THE *sert* SCHEME IN 2028 (2002 PRICES)

Benefit	Welfare	GDP
Business	£2,419,053	£2,419,053
Commuting	£2,083,957	
Others	£7,357,443	
Conventional User Benefits	**£11,860,453**	**£2,419,053**
Agglomeration	£548,779	£548,779
Imperfect Competition	£182,489	£182,489
Labour Supply	£24,293	£60,733
Wider Impacts	**£755,561**	**£792,001**
Total Benefits	**£12,616,014**	**£3,211,054**

1.38 Wider Impacts add a further £0.76m, or 6.4%, to the conventional user benefits figure of £11.9m, the majority of which are from agglomeration (73% of the total of WIs).

1.39 The GDP column shows productivity gains. The ***sert*** scheme contributes to the UK's economic output by £0.8m per annum by increasing the productivity of activity mostly in and around the area immediately surrounding the scheme. The main beneficiaries of the scheme, in terms of productivity gains, are the districts of Basildon and Southend-on-Sea. Thurrock also benefits from the scheme.

1.40 The wider impacts for the ***sert*****1** scheme are significantly lower than those for the ***sert*****2** scheme, and this brings down the overall increase in productivity. The reason for the relatively small effect of the ***sert*****1** scheme is its proximity to London. Both Basildon and Thurrock have good road and rail links to London, and so the economic effect of a scheme that links these two centres to each other is small.

1.41 In summary, this analysis shows that including Wider Impacts of the ***sert*** scheme would increase conventionally measured economic benefits by approximately 6.4%.

1.42 Including wider impacts increases the BCR for the ***sert*** network from **2.9:1** to **3.1:1**.