

**Local Economic Impact Method Assessment Summary Table**

**Model / Method**  
**Survey Method with Employment Density Calculations**

There are a number of different types of approaches / methods being used to estimate the economic impact of a transport scheme. This includes relatively simplistic survey-based approaches to much more sophisticated computable general equilibrium (CGE) models. Each of these can have general strengths and weaknesses and it is important to understand at the outset the basis of the approach and type of method that has been adopted. This prior consideration will give an early indication of the potential strengths and limitations associated with the type of approach.

|  | Business and / or individual surveys | Wage Equation Model | Computable General Equilibrium | Dynamic Model | Land Use and Transport Integration (LUTI)<br>Input / Output Model | Unclear | Other |
|--|--------------------------------------|---------------------|--------------------------------|---------------|---|---------|-------|
| What type of <b>approach / method</b> has been used? (please tick) | ✓                                    |                     |                                |               |   |         | ✓     |

If other, comment: In the main, this approach uses a combination of business surveys and employment density calculations to estimate the number of FTE jobs created by a transport improvement 'unlocking' an economic development opportunity

**Criteria**

**Consistency with Robust Economic Theory**

It is clear that the various approaches currently being used to assess the sub-national, regional or local impacts of a transport intervention are based on different fundamental economic relationships linking transport investment and impacts on economic activity.  
 A good method will provide strong grounds, in terms of the underlying economic theory and principles that form the framework for the method, to support the case that a transport intervention will lead to an increase in economic activity. It will, for example, demonstrate how the transport improvement is expected to feed through to higher levels of economic activity / GDP e.g. reduction in input costs, increases in output and / or employment? These relationships should be adequately explained in the documentation as should any further initiatives necessary to deliver the increase in economic activity.

Is there a clear explanation of the economic theory and principles that form the framework for the method?

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|  | Yes | Comment: While the theory behind the approach is relatively simple in comparison to the other approaches assessed, the explanation is clear. Poor transport connections act as an inhibitor to local business performance or restricts economic growth through, say, limiting accessibility. By improving |
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|  |  |     | transport links to potential development areas this can improve accessibility and open up new opportunities for business to start up or expand. Depending on the type of development, this leads to employment creation. Multipliers are also applied to jobs created to calculate indirect and induced employment.  |
| Are the relationships via which the transport intervention is expected to feed through to a change in economic activity consistent with robust economic theories?  |  | Yes | Comment: It is assumed that the transport improvement will unlock potential development which will then lead to a more attractive location for businesses, encourage new firms to the area and result in employment creation.  |
| <b>Empirical evidence</b>  | <p>Evidence should be presented to support the impact of the transport improvement on the local economy. However, the literature to date suggests that the evidence to support the claimed direct linkages between transport investment and impacts on economic activity is not conclusive.</p> <p>A good method will therefore provide evidence to support the claimed impacts of the scheme and also indicate the robustness and/or uncertainties of the evidence.</p> <p>It should also explain why the evidence is relevant to the study / analysis e.g. the same mode, the same local labour market conditions apply, similar area characteristics and sectoral mix, similar scale etc.</p> <p>A particular source of uncertainty can be the direction of causality. Many factors – for example, transport connectivity and employment density – are closely correlated and it is difficult to separate the cause and effect. The method should therefore recognise where this is a difficulty and provide supporting evidence to distinguish between cause and effect in its assumed economic relationships.</p> |     |  |
| Does the method provide a clear and appropriate description of the empirical evidence that supports the claimed impacts, and also indicate the robustness of, and uncertainties associated with, the evidence? | No   |     | Comment: It is unclear from the assessments which have used this approach precisely how the transport improvement unlocks the development site i.e. will firms not simply locate elsewhere nearby if the site isn't unlocked? The evidence supporting the job creation is not conclusive and may be subject to bias i.e. based on business surveys where respondents may have an incentive to answer the question in a particular way. Further empirical evidence is also required on the number of FTEs created per m <sup>2</sup> of floorspace for each type of business type e.g. retail, office, factory etc. Multipliers for indirect and induced jobs also lack strong supporting evidence. |
| Does the method provide a robust justification of why the evidence is relevant for specific types of study / analysis, and also explain if there are limitations associated with its use?                      | No   |     | Comment: There are a number of possible limitations associated with the approach which are not directly dealt with e.g. evidence supporting links between development and growth, level of multipliers, number of FTEs created for each type of development.   |

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| Does the method provide robust evidence for the claimed direction of causality between cause and effect of any claimed economic relationships e.g. the transport intervention and change in economic outcomes? | No  |               | Comment: Limited evidence provided about how transport improvements can unlock development and directly lead to employment creation.  |  |
| Are sensitivity tests provided that show the impact of changes in key assumptions and empirical estimates that are used?   | No  |               | Comment: In examples seen, little, if any, sensitivity tests have been carried out to show a possible range of impacts under different assumptions.   |  |
| <b>Sub-criteria - assessment of Land Use and Availability of Land</b>  | Conventional transport models generally assume a fixed land use and that transport improvements accrue to existing businesses only by increasing productivity through, for example, reducing travel costs and through benefits from agglomeration. Local economic impact models however can be based on the assumption of flexible land use and business/workforce relocation (to allow a move to more productive jobs and an increase in total employment in the study area). It is important to understand these assumptions and their robustness as many of the benefits claimed are due to entrants into the local labour market leading to increased productivity and growth.<br>The method should also be clear whether assumptions about changes in land use have implications for the estimates of demand derived from the transport model if this is based on a different land use assumption. |               |   |  |
| Does the method provide robust explanation of why land use is assumed to be fixed, flexible, or flexible with constraints?   | Fixed   | Flexible<br>✓ | Flexible with constraints   | Comment: A simple approach which is dependent on flexible land use |
| Does the method provide robust theoretical and empirical evidence for the claimed relationship between the transport intervention and the impact on the location of businesses and workers?                    | No  |               | Comment: Limited evidence to support the claim that businesses will locate to a particular area after scheme implementation. Some cases have used business survey evidence and local plans, but this has generally been weak. |  |
| If the method assumes flexible land use, are estimates of changes in land use taken into account in the estimates of transport demand?   |   | Yes           | Comment:  |  |
| Are the assumptions about land use consistent with the relevant land use planning frameworks?  |   | Yes           | Comment: In many cases the assumed land use is informed by local planning frameworks.   |  |
| <b>Sub-criteria - Labour Supply</b>  | It is important that a method or model used can clearly explain the impact and assumptions on the supply of labour.   |               |   |  |

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|   | <p>Presenting a transparent account of the impacts on the labour supply will be crucial to the credibility of the method and results. For example, in estimating job / employment impacts, what assumptions are made about the supply of labour and how it contributes to higher levels of activity?</p> <p>The method should be clear whether the results are dependent on a supply of labour resource e.g. unemployed labour, and provide the evidence to demonstrate that this exists in the form assumed e.g. skilled or unskilled or whether an increases in the labour force are a result of relocation of workers from outside the study area and, if so, whether from other parts of the UK or abroad.</p> <p>The model should also be clear about, if there is claimed additional output per person, what causes the increased output? Evidence should be provided to support this effect and that it is a cause of the transport improvement. The method should explain whether the increase in output is from 'real' agglomeration effects as measured through wider impacts guidance i.e. within the existing sectoral mix, or is the increase in output generated by productivity impacts brought about by a change in the sectoral mix with low value jobs shifting out of the study area and higher value ones moving in.</p> <p>A good method should therefore be clear whether the method assumes relocation of labour and / or business under the do-something option and where the labour supply has come.</p> |                  |   |   |
| <p>Does the method provide a robust case, consistent with theory and empirical evidence, of how the transport intervention is assumed to affect labour supply in the study area and how this contributes to higher levels of economic activity?</p> | <p>No</p>   | <p>Yes<br/>✓</p> | <p>Unclear</p>  | <p>Comment: The theory is very dependent on the availability of local labour supply. However, there does tend to be any analysis of the availability of labour supply and whether the potential local workforce has the necessary skills and qualifications to meet the requirements of new employers. In many cases it is simply assumed that the supply of labour with the necessary skills is readily available to take up the new employment opportunities.</p> |
| <p><b>Sub-criteria - Elasticities</b></p>   | <p>A number of the approaches for calculating local economic impacts, and the results generated, are dependent on robust estimates of labour supply elasticities and the response of the workforce to changes in wages. A number also include elasticities of productivity with respect to effective density.</p> <p>It should also be made clear whether the elasticities used are evidence-based or whether there are possible limitations e.g. are the elasticities applicable to the occupations and/or geographic area that contribute to the increases in economic activity, and if not what are the implications?</p> <p>Information should be provided about the sensitivity of the estimated outcomes to uncertainties around the elasticity values and the extent of these uncertainties.</p>   |                  |   |   |
| <p>If the method is dependent upon elasticities, does the method explain the evidence upon which the elasticities are based?</p>  | <p>No</p>   | <p>Yes</p>       | <p>Comment: n/a. The approach is not dependent on elasticities.</p> |   |

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| Is the supporting evidence for these elasticities robustly based on empirical evidence and suitable for the specific use in which they are being applied?   |  |     | Comment's/a  |  |
| Does the method clearly explain the uncertainties around the elasticity values, the extent of these uncertainties, and the impact that these uncertainties could have on estimates that are generated from the method of the economic activity impacts of a transport intervention? |  |     | Partially  | Comment: n/a   |
| <b>Dependency on other factors</b>  |  |     |  |  |
|   | <p>It is important to understand whether the impacts predicted by the models are dependent on other factors occurring / complementing the transport investment. SACTRA concluded that additional, non-transport investment is generally required to deliver economic impacts. In addition, Eddington concluded that, in itself, transport investment may not create additional economic activity i.e. it is conditional on other factors, such as local market circumstances and labour market conditions. The method should therefore clearly explain whether the impacts on economic activity are dependent on the transport investment alone, or whether it is assumed to act as a catalyst for a number of other structural changes and market conditions in the local economy, e.g. flexible labour market, under-employment of land and capital, business capital, housing, business premises etc, and whether such assumptions are credibly supported by evidence.</p> <p>Also, it will be important that the non-transport factors that are needed to generate the impacts are made explicit, including their own benefits, costs and externalities. In addition, evidence should be provided to show that the non-transport impacts are likely to materialise. For example, by specifying any constraints on planning permission that might influence the level and location of development.</p> <p>If the method is dependent on other, non-transport factors materialising, the costs associated with these impacts should be included in the scheme assessment. In addition, these costs should include the impact of any local contribution to the scheme. It should also be clear whether method takes account of opportunity costs.</p> |     |  |  |
| Does the method explain whether the impacts estimated are dependent on other factors occurring / complementing the transport investment?  |  | Yes | Comment: Dependent on business premises being built and becoming available in response to the transport investment |  |
| Are the non-transport factors that are needed to generate the impacts made explicit, including  | No   |     |  | Comment: No costs associated with the other factors are taken into account e.g. the costs and benefits to businesses of the new premises, the costs of |

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| estimates of their own benefits and costs included externalities?  |  |     |  | training the workforce etc  |
| Is evidence provided that the non-transport factors are likely to materialise?   |  | Yes |  | Comment: In some cases survey evidence is provided of the lack of suitable premises in the area and that businesses will re-locate if these become available in the local area  |
| <b>Counterfactual / Do-minimum</b>   | <p>Any economic impact assessment implicitly or explicitly involves the comparison of a Test Case with a Do Minimum or Reference Case. Understanding this counterfactual is crucial to the assertion of whether an intervention is likely to have the estimated effect, particularly if there are other proposals or schemes included in the Do Minimum which could influence the quantum of impacts of the proposal under consideration. It is important therefore that model users provide a clear explanation of a counterfactual so that there is transparency around the assumptions made with regard to the scenario where the proposed scheme is not introduced.</p> <p>It will also be important to understand whether the Do Minimum is comparable with the 'do-minimum' of the cost benefit analysis transport appraisal.</p> <p>A good method should therefore explain details of the counterfactual, particularly whether it is consistent with the do-minimum assumed in the CBA.</p> |     |  |   |
| Does the method provide a clear explanation of the counterfactual so that there is transparency around the assumptions made with regard to the scenario where the proposed scheme is not introduced? |  | Yes |  | Comment: The method is dependent on an understanding of what will happen under a do-nothing scenario. However, the evidence shows that this is not always provided.   |
| <b>Data Use and Availability</b>   | <p>Many of the methods / models are highly dependent on specific data requirements, particularly at the local or regional level eg local levels of labour productivity by sector. However, in many cases this data is not readily available, and it will therefore be important to understand these requirements and limitations of the approach if the data is not available.</p> <p>The extent to which the data which is best suited to the analysis has been used should be made clear, as should the reliance placed on data which has been used but is less than ideal, for example because it covers a wider or different geographical area on the grounds that the ideal data is not available. It should also explain whether there any limitations or weaknesses with the data used e.g. has proxy data been used and, if so, whether it has possible limitations.</p>   |     |  |   |
| Does the method explain why the data that is used is best suited to the analysis?  | No   |     |  | Comment: The examples considered have tended to use different data to support the individual cases. This is generally due to the proportionate approach adopted and the use of whatever data is available. For example, business survey data has been used in those cases where it has been |

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|   |   |     |           | available, but has not been used in others. Where data has not been readily available the business case tends to be weaker.  |
| Does the method explain limitations or weaknesses associated with the data that is used, and identify how these could affect the analysis?                        | No  |     |           | Comment: There are concerns about the suitability and robustness of the data e.g. survey evidence being biased   |
| Is the data required for application of the method freely and readily available for the study area under consideration?   |   | Yes |           | Comment: The approach is heavily dependent on the availability of business survey evidence and available planning data, though the former may not necessarily be readily available.  |
| <b>Uses and Limitations of the Method</b>   | It is important to understand the limitations associated with the use of a particular method e.g. are there theoretical or empirical limitations with specific applications of the approach the approach and are the assumptions of the method not suitable for use for specific applications.  |     |           |  |
| Are the key limitations associated with applying the method clearly explained?  | No  |     |           | Comment: There are clear limitations with applying this approach across all types of schemes e.g. it is more suited to small, local projects than to large cross-boundary projects.  |
| Are the assumptions associated with the approach clearly documented so that they are open to considering the suitability of the method for specific applications? |   |     | partially | Comment: In some cases the assumptions are clearly spelled out, e.g. how many businesses will locate in the unlocked development and by when, but in others the assumptions around business decisions, labour supply, etc are not. |
| <b>Calibration and Validation</b>   | <p>A potential key issue for determining the suitability and robustness of the methods will be the calibration and validation of the models used.</p> <p>The terms 'calibration' and 'validation' are more generally associated with 'models' as opposed to 'approaches'. In a transport model context these terms are well understood in terms of (a) the models representing the present day observed situation, and (b) the models responses to certain changes in inputs (e.g. a fuel price increase) being within accepted and established ranges.</p> <p>In this case though, the modelled relationships are not well understood or accepted. In addition the complexity involved (i.e. the myriad of factors which affect the real economy) means that there is very little scope to 'validate' models against observed outcomes over time. For example, it is not possible to validate a land use model in the same way as a transport model. These models are built up from a large number of relationships which themselves have been derived via empirical or theoretical evidence.</p> <p>Instead this therefore comes back to the strength of the evidence used to support the key relationships being modelled. For</p> |     |           |  |

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|   | example, the derivation of elasticities and the evidence produced to support these values is a key issue.  |          |           |   |
| Is the evidence used to support the key relationships that are included in the method consistent with robust theory and empirical evidence, such as the evidence used for the derivation of elasticities? | No   |          |           | Comment: The method is heavily dependent on evidence to support the claimed impacts and relationships between transport investment and economic performance, but the assessments reviewed are lacking in hard evidence. |
| <b>Compatibility with Transport Model and with Transport Appraisal</b>  | It is important that assumptions in the method used to estimate the local economic impacts are consistent with the main transport modelling and transport appraisal assumptions. A good method should be clear that there are no contradictions between the two sets of assumptions e.g. are these the same as have been used in estimating the relationship between transport costs and output (or employment) from which the employment or productivity elasticities have been derived? Are all mode costs combined or analysed separately?  |          |           |   |
| Are the assumptions in the method for estimating local economic impacts consistent with the main transport appraisal assumptions? If not, are any deviations in the assumptions soundly justified?        | No   | Yes<br>✓ | Partially | Comment:  |
| <b>Metrics</b>  | The different methods may present the outputs using different metrics. For example, some are presented in changes to GDP and / or GVA and / or employment. It may be that DfT or the decision makers for whom the analysis is being undertaken want the results to be presented using a particular metric, perhaps to allow comparison across projects. The output metrics used should be appropriate and meaningful in terms of meeting DfT requirements and informing policy decisions.  |          |           |   |
| Are the metrics reported by the method useful and appropriate for informing the relevant decision makers?   |  | Yes      |           | Comment: The key metric is the change in employment.  |
| <b>Winners and Losers and Spatial Distribution</b>  | This is a key criterion in the assessment, as many economic impact assessments focus solely on the immediate area of impact, without differentiating between newly generated economic activity and activity which has been redistributed from outside of the study area. To meet DfT requirements the results should show the economic impact at the national level as well as the local / regional / sub-national level. The introduction of new or improved transport links can clearly have more than one impact between the areas they are connecting. For example, both areas could see improvements, or at least net improvements as different sectors within each |          |           |   |



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|  | <p>area are affected positively or negatively. Alternatively, one area could gain at the expense of the other. Indeed, it is possible that the area intended to benefit could see a negative impact on economic activity under certain circumstances e.g. inefficient industry and labour market being exposed to outside competition – the so called two-way road effect.</p> <p>While there are no hard and fast rules on which areas would benefit or lose in response to a transport intervention, it is important to assess how the model takes account of the impacts outside the study area and explain how factors such as economic activity, labour market performance etc are affected outside the study area (if at all). Again the evidence base underlying this will be important.</p> <p>Implicit in this is the importance that the spatial area is covered by the model e.g. local or regional and whether it accounts for impacts beyond the study area in any way. The approach should make clear how the redistribution of economic activity and of households is estimated and modelled.</p> <p>In addition, the method should explain how the displacement of the activities that move to the places benefitting from transport investment has been estimated and modelled. The method should also demonstrate to what extent displacement takes place <i>within</i> the study area and the impacts of this and whether the regions outside the study area from which economic activity is displaced identified.</p> <p>Finally, the models tend to deal with economic impacts (costs and benefits) that materialise over different time periods. The model needs to compare impacts of a particular intervention over different timescales, including the discounting which is applied to ensure like for like comparisons. A consistent approach is therefore required to ensure impacts associated with a particular scheme and its performance can be compared on a like-for-like basis.</p> |  |   |
| Does the method take account of, and include estimates for, the impact of the transport proposal on other geographical areas outside the area that is under consideration? | No  |  | Comment: In examples reviewed there is little consideration of the impact outside the boundary of the area under consideration as this is not an objective of the analysis. This is one of the key weaknesses of this approach. However, the method could be adapted to account for this. |
| Does the method have a robust approach to estimating additionality and displacement of economic activity?  | No  |  | Comment: The general application of this approach doesn't tend to take account of displaced activity.   |
| Does the method apply an appropriate approach to discounting impacts that are generated in future years?   | No  |  | Comment: No discounting is applied to future year impacts.  |
| <b>Non-economic Impacts</b>  |   |  |   |
| Does the economic or any other analysis identify other impacts such as the environment and non-  | No  |  | Comment:  |

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| work / social, which might have an impact on the location of households and employment?  |  |  |   |
| What account has been taken of the possible indirect effects on economic output, and is robust evidence provided and explained of these impacts? | Comment: The approaches reviewed estimate figures for indirect and induced employment impacts, but little evidence is provided to support these. |  |   |
| <b>Implementability</b>  |  |  |   |
| Does the method include clear and accurate guidance on its implementation and any limitations with its use that users should be aware of?        | No   |  | Comment: A fairly straightforward approach to implement, which is unlikely to face any limitations with model ownership. While the approach could be used in a proportionate way to assess the impact of small schemes, if not carried out properly there are a number of weaknesses, such as the lack of evidence base to support the current transport constraints, evidence of the behaviour of businesses under the do-something scenario, information on the availability of a suitably qualified labour force, the impact on other area etc. However, these weaknesses could be overcome if applied properly. |

### Local Economic Impact Method Assessment Summary Table

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|---|---|---------------------|--------------------------------|---------------|---|---------|-------|
| <b>Model / Method</b><br><b>Regeneration Impacts and Economic Activity and Location Impacts</b> | There are a number of different types of approaches / methods being used to estimate the economic impact at a sub-national level of a transport scheme. This includes relatively simplistic survey-based approaches to much more sophisticated computable general equilibrium (CGE) models. Each of these can have general strengths and weaknesses and it is important to understand at the outset the basis of the approach and type of method that has been adopted. This prior consideration will give an early indication of the potential strengths and limitations associated with the type of approach. |                     |                                |               |   |         |       |
|   | Business and / or individual surveys  | Wage Equation Model | Computable General Equilibrium | Dynamic Model | Land Use and Transport Integration (LUTI) | Unclear | Other |
| What type of <b>approach / method</b> has been used? (please tick)                              |   |                     |                                |               | Input / Output Model                      |         | ✓     |

If other, comment: More sophisticated approaches to the survey based method are included in national transport appraisal guidance documents, such as DfT's guidance on Regeneration Impacts and Transport Scotland's Economic Activity and Location Impacts (EALI). The Regeneration Impacts guidance is designed to assist appraisers assess the impacts of a transport scheme in a regeneration area in terms of employment, while the EALI guidance is intended to provide a framework to assess the impact of a transport intervention on the economy measured through changes in output (GDP / GVA) and / or employment. The EALI analysis assesses the distribution of the national impacts captured through the TEE and Wider Impacts analysis. The impacts are not additional to those measured using conventional transport appraisal cost benefit analysis but are simply presented in a different way i.e. GVA and / or jobs. The approaches do not necessarily involve applying a unique method, however they could provide a useful discipline and framework for carrying out assessments of sub-national impacts of transport interventions

**Criteria**

**Consistency with Robust Economic Theory**

It is clear that the various approaches currently being used to assess the sub-national, regional or local impacts of a transport intervention are based on different fundamental economic relationships linking transport investment and impacts on economic activity.  
 A good method will provide strong grounds, in terms of the underlying economic theory and principles that form the framework for the method, to support the case that a transport intervention will lead to an increase in economic activity. It will, for example, demonstrate how the transport improvement is expected to feed through to higher levels of economic activity / GDP e.g. reduction in input costs, increases in output and / or employment? These relationships should be adequately explained in the documentation as should any further initiatives necessary to deliver the increase in economic activity.

Is there a clear explanation of the economic theory and principles that form the framework for the method?

No

Yes  
✓

Comment: It is based on the theory that changes to transport provision can impact on economic performance through reducing costs, improving productivity and therefore increasing output and employment. The change in economic performance can be generated by, for example, improving access to a more suitable workforce, increasing access to suppliers and customers, or providing access to suitable employment for workers. The frameworks essentially involve an audit of the existing situation in terms of the make-up of the local economy (the key sectors and labour market situation) and how the current transport network is acting as a constraint on local economic performance. This is followed by analysis of how the transport scheme will help remove constraints, and evidence gathering of the impacts in terms of changes to employment (and GVA for the EALI analysis) The

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|  |  |          | evidence is gathered from local information / statistics supplemented by interviews and surveys.  |
| Are the relationships via which the transport intervention is expected to feed through to a change in economic activity consistent with robust economic theories?  | No   | Yes<br>✓ | Comment:The relationship described above are consistent with transport economic theory  |
| <b>Empirical evidence</b>  | <p>Evidence should be presented to support the impact of the transport improvement on the local economy. However, the literature to date suggests that the evidence to support the claimed direct linkages between transport investment and impacts on economic activity is not conclusive.</p> <p>A good method will therefore provide evidence to support the claimed impacts of the scheme and also indicate the robustness and/or uncertainties of the evidence.</p> <p>It should also explain why the evidence is relevant to the study / analysis e.g. the same mode, the same local labour market conditions apply, similar area characteristics and sectoral mix, similar scale etc.</p> <p>A particular source of uncertainty can be the direction of causality. Many factors – for example, transport connectivity and employment density – are closely correlated and it is difficult to separate the cause and effect. The method should therefore recognise where this is a difficulty and provide supporting evidence to distinguish between cause and effect in its assumed economic relationships.</p> |          |   |
| Does the method provide a clear and appropriate description of the empirical evidence that supports the claimed impacts, and also indicate the robustness of, and uncertainties associated with, the evidence? | No   | Yes<br>✓ | Comment:While clear guidance is provided on the need to support any claimed impacts with supporting evidence, the examples seen of its application have not always included this. For example, a number of cases have not always provided strong evidence of the role that transport plays in supporting local businesses and that the current level of transport provision is acting as a constraint on economic performance and affecting output or employment levels.  |
| Does the method provide a robust justification of why the evidence is relevant for specific types of study / analysis, and also explain if there are limitations associated with its use?                      | No   | Yes<br>✓ | Comment:In the case of the regeneration impacts analysis, it is explained that the approach is only required for schemes in regeneration areas as the key objective is to understand how transport can support regeneration in economically deprived locations, however the method could easily be widened to include all areas if the focus was on estimating changes in employment and / or output. In terms of limitations with the approach, it is less suited to large sub-national schemes covering significant spatial areas. This is due to the significant business surveys required to provide the necessary data for the analysis. |
| Does the method provide robust evidence for the claimed direction of causality between cause   | No   | Yes<br>✓ | Comment:Evidence is required to fully understand why transport is acting as a constraint on economic performance in the local area (through, say, interviews and business   |

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| and effect of any claimed economic relationships e.g. the transport intervention and change in economic outcomes?   |   |          | surveys) and how the intervention will remove the constraints and lead to higher levels of employment and / or output.  |             |
| Are sensitivity tests provided that show the impact of changes in key assumptions and empirical estimates that are used?  | No  | Yes<br>✓ | Comment: The guidance recognises the limitations with the approach and recommends sensitivity tests are carried out on the risks and uncertainties. Changes to key assumptions should be tested to understand the potential variation in impacts.   |             |
| <b>Sub-criteria - assessment of Land Use and Availability of Land</b>   | Conventional transport models generally assume a fixed land use and that transport improvements accrue to existing businesses only by increasing productivity through, for example, reducing travel costs and through benefits from agglomeration. Local economic impact models however can be based on the assumption of flexible land use and business/workforce relocation (to allow a move to more productive jobs and an increase in total employment in the study area). It is important to understand these assumptions and their robustness as many of the benefits claimed are due to entrants into the local labour market leading to increased productivity and growth.<br>The method should also be clear whether assumptions about changes in land use have implications for the estimates of demand derived from the transport model if this is based on a different land use assumption. |          |   |             |
| Does the method provide robust explanation of why land use is assumed to be fixed, flexible, or flexible with constraints?  | Fixed   | Flexible | Flexible with constraints   | Comment:n/a |
| Does the method provide robust theoretical and empirical evidence for the claimed relationship between the transport intervention and the impact on the location of businesses and workers? | No  | Yes<br>✓ | Comment: This is a key aim of the approach; to understand how the transport scheme under consideration will impact on the location of businesses and workers. Analysis is required of how the scheme will improve the attractiveness of the area for businesses. The EALI provides detailed guidance on demonstrating the links between transport improvements and inward investments and how transport can attract and feed through to changes in economic growth. |             |
| If the method assumes flexible land use, are estimates of changes in land use taken into account in the estimates of transport demand?  | No  | Yes      | Comment: n/a  |             |
| Are the assumptions about land use consistent with the relevant land use planning frameworks?   | No  | Yes<br>✓ | Comment: A key aspect of the analysis is to demonstrate consistency with land use planning documents.   |             |
| <b>Sub-criteria - Labour Supply</b>   | It is important that a method or model used can clearly explain the impact and assumptions on the supply of labour. Presenting a transparent account of the impacts on the labour supply will be crucial to the credibility of the method and   |          |   |             |

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|  | <p>results. For example, in estimating job / employment impacts, what assumptions are made about the supply of labour and how it contributes to higher levels of activity?</p> <p>The method should be clear whether the results are dependent on a supply of labour resource e.g. unemployed labour, and provide the evidence to demonstrate that this exists in the form assumed e.g. skilled or unskilled or whether an increases in the labour force are a result of relocation of workers from outside the study area and, if so, whether from other parts of the UK or abroad.</p> <p>The model should also be clear about, if there is claimed additional output per person, what causes the increased output? Evidence should be provided to support this effect and that it is a cause of the transport improvement. The method should explain whether the increase in output is from 'real' agglomeration effects as measured through wider impacts guidance i.e. within the existing sectoral mix, or is the increase in output generated by productivity impacts brought about by a change in the sectoral mix with low value jobs shifting out of the study area and higher value ones moving in.</p> <p>A good method should therefore be clear whether the method assumes relocation of labour and / or business under the do-something option and where the labour supply has come.</p> |          |             |  |
| Does the method provide a robust case, consistent with theory and empirical evidence, of how the transport intervention is assumed to affect labour supply in the study area and how this contributes to higher levels of economic activity? | No  | Yes<br>✓ | Unclear     | Comment:Both approaches require evidence to be provided to support the claims about impacts on the labour market e.g. does the available labour supply have the qualifications and skills to take up the new employment opportunities that may become available, or is the current transport provision acting as a constraint on residents entering the workforce? Also, how will the transport scheme increase productivity within the current workforce? |
| <b>Sub-criteria - Elasticities</b>   | <p>A number of the approaches for calculating local economic impacts, and the results generated, are dependent on robust estimates of labour supply elasticities and the response of the workforce to changes in wages. A number also include elasticities of productivity with respect to effective density.</p> <p>It should also be made clear whether the elasticities used are evidence-based or whether there are possible limitations e.g. are the elasticities applicable to the occupations and/or geographic area that contribute to the increases in economic activity, and if not what are the implications?</p> <p>Information should be provided about the sensitivity of the estimated outcomes to uncertainties around the elasticity values and the extent of these uncertainties.</p>   |          |             |  |
| If the method is dependent upon elasticities, does the method explain the evidence upon which the elasticities are based?  | No  | Yes      | Comment:n/a |  |
| Is the supporting evidence for these elasticities  | No  | Yes      | Comment:n/a |  |

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| robustly based on empirical evidence and suitable for the specific use in which they are being applied?   |  |          |   |  |
| Does the method clearly explain the uncertainties around the elasticity values, the extent of these uncertainties, and the impact that these uncertainties could have on estimates that are generated from the method of the economic activity impacts of a transport intervention? | No   | Yes      | Partially   | Comment:n/a  |
| <b>Dependency on other factors</b>  | <p>It is important to understand whether the impacts predicted by the models are dependent on other factors occurring / complementing the transport investment. SACTRA concluded that additional, non-transport investment is generally required to deliver economic impacts. In addition, Eddington concluded that, in itself, transport investment may not create additional economic activity i.e. it is conditional on other factors, such as local market circumstances and labour market conditions. The method should therefore clearly explain whether the impacts on economic activity are dependent on the transport investment alone, or whether it is assumed to act as a catalyst for a number of other structural changes and market conditions in the local economy, e.g. flexible labour market, under-employment of land and capital, business capital, housing, business premises etc, and whether such assumptions are credibly supported by evidence.</p> <p>Also, it will be important that the non-transport factors that are needed to generate the impacts are made explicit, including their own benefits, costs and externalities. In addition, evidence should be provided to show that the non-transport impacts are likely to materialise. For example, by specifying any constraints on planning permission that might influence the level and location of development.</p> <p>If the method is dependent on other, non-transport factors materialising, the costs associated with these impacts should be included in the scheme assessment. In addition, these costs should include the impact of any local contribution to the scheme. It should also be clear whether method takes account of opportunity costs.</p> |          |   |  |
| Does the method explain whether the impacts estimated are dependent on other factors occurring / complementing the transport investment?  | No   | Yes<br>✓ | Comment: The EALI documentation explains that analysis should be carried out to understand what other, non-transport factors, are required to deliver the benefits and what evidence should be gathered to support this. This is not included as part of the Regeneration Impacts analysis. |  |
| Are the non-transport factors that are needed to generate the impacts made explicit, including estimates of their own benefits and costs  | No<br>✓  | Yes      | n/a   | Comment: Costs are generally not allocated to many of the non-transport factors e.g. the cost of building premises or the resources required to train the supply of labour |

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| included externalities?  |  |          |           |   |
| Is evidence provided that the non-transport factors are likely to materialise?   | No<br>✓  | Yes      | n/a       | Comment: In some cases. However not all applications reviewed have provided supporting evidence to demonstrate that the non-transport factors will materialise, particularly under within the timescales assumed.   |
| <b>Counterfactual / Do-minimum</b>   | <p>Any economic impact assessment implicitly or explicitly involves the comparison of a Test Case with a Do Minimum or Reference Case. Understanding this counterfactual is crucial to the assertion of whether an intervention is likely to have the estimated effect, particularly if there are other proposals or schemes included in the Do Minimum which could influence the quantum of impacts of the proposal under consideration. It is important therefore that model users provide a clear explanation of a counterfactual so that there is transparency around the assumptions made with regard to the scenario where the proposed scheme is not introduced.</p> <p>It will also be important to understand whether the Do Minimum is comparable with the 'do-minimum' of the cost benefit analysis transport appraisal.</p> <p>A good method should therefore explain details of the counterfactual, particularly whether it is consistent with the do-minimum assumed in the CBA.</p> |          |           |   |
| Does the method provide a clear explanation of the counterfactual so that there is transparency around the assumptions made with regard to the scenario where the proposed scheme is not introduced? | No   | Yes<br>✓ | Unclear   | Comment:  |
| <b>Data Use and Availability</b>   | <p>Many of the methods / models are highly dependent on specific data requirements, particularly at the local or regional level eg local levels of labour productivity by sector. However, in many cases this data is not readily available, and it will therefore be important to understand these requirements and limitations of the approach if the data is not available.</p> <p>The extent to which the data which is best suited to the analysis has been used should be made clear, as should the reliance placed on data which has been used but is less than ideal, for example because it covers a wider or different geographical area on the grounds that the ideal data is not available. It should also explain whether there any limitations or weaknesses with the data used e.g. has proxy data been used and, if so, whether it has possible limitations.</p>   |          |           |   |
| Does the method explain why the data that is used is best suited to the analysis?  | No   | Yes<br>✓ | Partially | Comment: The guidance is strong on what data / evidence is required to build up the case on the role of transport in supporting the local economy, how the current provision is acting as a constraint and how the improvements will remove the constraint and act as a generator of increased output and / or employment creation. |



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| Does the method explain limitations or weaknesses associated with the data that is used, and identify how these could affect the analysis?   | No      | Yes<br>✓ | Partially | Comment:There is unlikely to be sufficient information available to support the claimed impacts. In these cases it is explained that surveys should be carried out with businesses to understand and analyse the potential behavioural response of different 'sectors' and 'economic actors' in the market. This could include firms in different industries (eg manufacturing and services) in the area to understand how key players in the area may respond to the new transport provision. Also, property and recruitment specialists to understand the impact on commercial and residential premises and the labour market.   |
| Is the data required for application of the method freely and readily available for the study area under consideration?  | No<br>✓ | Yes      | Partially | <p>Comment: The majority of the information required will need to be gathered through survey evidence. For example, to understand the impact on businesses information will need to be gathered on:</p> <ul style="list-style-type: none"> <li>• Current performance, including size, recent growth, profitability/margins;</li> <li>• Future objectives and aspirations – products, size, markets, production locations;</li> <li>• Current and future/expected constraints, to include physical resources, human resources, management and capital;</li> <li>• Output/product market conditions/competitiveness; location and size of main competitors;</li> <li>• The significance of transport and accessibility to the business; and</li> <li>• The role of changes in transport costs and journey time reliability in overcoming constraints and achieving future objectives and aspirations.</li> </ul> |
| <p><b>Uses and Limitations of the Method</b></p> <p>It is important to understand the limitations associated with the use of a particular method e.g. are there theoretical or empirical limitations with specific applications of the approach the approach and are the assumptions of the method not suitable for use for specific applications.</p> |         |          |           |  |
| Are the key limitations associated with applying the method clearly explained?   | No      | Yes<br>✓ | Partially | Comment:Limitations are clearly explained as the approach is more suited to certain types of schemes e.g. small, local interventions. There can be limitations with data availability, supporting evidence to back the claims, bias in survey evidence, calibrating the economic relationships / linkages. It is explained therefore that a case-by-case approach should be undertaken   |

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|   |   |          |           | and tailored to the type of intervention under consideration or the appropriate spatial level. This can then form a partial analysis with the degree of of quantification proportionate to the size of the study, the scale of the option under consideration and the expected relative significance of the scheme in terms of anticipated impacts. |
| Are the assumptions associated with the approach clearly documented so that they are open to considering the suitability of the method for specific applications?   | No  | Yes<br>✓ | Partially | Comment:Under this approach it is emphasised that all assumptions made as part of the analysis are well documented.   |
| <b>Calibration and Validation</b>   | <p>A potential key issue for determining the suitability and robustness of the methods will be the calibration and validation of the models used.</p> <p>The terms 'calibration' and 'validation' are more generally associated with 'models' as opposed to 'approaches'. In a transport model context these terms are well understood in terms of (a) the models representing the present day observed situation, and (b) the models responses to certain changes in inputs (e.g. a fuel price increase) being within accepted and established ranges.</p> <p>In this case though, the modelled relationships are not well understood or accepted. In addition the complexity involved (i.e. the myriad of factors which affect the real economy) means that there is very little scope to 'validate' models against observed outcomes over time. For example, it is not possible to validate a land use model in the same way as a transport model. These models are built up from a large number of relationships which themselves have been derived via empirical or theoretical evidence.</p> <p>Instead this therefore comes back to the strength of the evidence used to support the key relationships being modelled. For example, the derivation of elasticities and the evidence produced to support these values is a key issue.</p> |          |           |   |
| Is the evidence used to support the key relationships that are included in the method consistent with robust theory and empirical evidence, such as the evidence used for the derivation of elasticities? | No  | Yes<br>✓ |           | Comment:Evidence to support the claimed impacts is a crucial part of the analysis and the guidance focuses on the types of information and data that should be used and how this should be gathered i.e. primarily through business surveys   |
| <b>Compatibility with Transport Model and with Transport Appraisal</b>  | <p>It is important that assumptions in the method used to estimate the local economic impacts are consistent with the main transport modelling and transport appraisal assumptions. A good method should be clear that there are no contradictions between the two sets of assumptions e.g. are these the same as have been used in estimating the relationship between transport costs and output (or employment) from which the employment or productivity elasticities have been derived? Are</p>  |          |           |   |

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|  | <b>all mode costs combined or analysed separately?</b>   |          |   |          |
| Are the assumptions in the method for estimating local economic impacts consistent with the main transport appraisal assumptions? If not, are any deviations in the assumptions soundly justified? | No   | Yes<br>✓ | Partially   | Comment: |
| <b>Metrics</b>   | <p>The different methods may present the outputs using different metrics. For example, some are presented in changes to GDP and / or GVA and / or employment. It may be that DfT or the decision makers for whom the analysis is being undertaken want the results to be presented using a particular metric, perhaps to allow comparison across projects.</p> <p>The output metrics used should be appropriate and meaningful in terms of meeting DfT requirements and informing policy decisions.</p>  |          |   |          |
| Are the metrics reported by the method useful and appropriate for informing the relevant decision makers?  | No   | Yes<br>✓ | Comment: The metrics are GVA and / or employment. These can also be supplemented by impacts on socio-economic indicators such as deprivation. |          |
| <b>Winners and Losers and Spatial Distribution</b>   | <p>This is a key criterion in the assessment, as many economic impact assessments focus solely on the immediate area of impact, without differentiating between newly generated economic activity and activity which has been redistributed from outside of the study area. To meet DfT requirements the results should show the economic impact at the national level as well as the local / regional / sub-national level.</p> <p>The introduction of new or improved transport links can clearly have more than one impact between the areas they are connecting. For example, both areas could see improvements, or at least net improvements as different sectors within each area are affected positively or negatively. Alternatively, one area could gain at the expense of the other. Indeed, it is possible that the area intended to benefit could see a negative impact on economic activity under certain circumstances e.g. inefficient industry and labour market being exposed to outside competition – the so called two-way road effect.</p> <p>While there are no hard and fast rules on which areas would benefit or lose in response to a transport intervention, it is important to assess how the model takes account of the impacts outside the study area and explain how factors such as economic activity, labour market performance etc are affected outside the study area (if at all). Again the evidence base underlying this will be important.</p> <p>Implicit in this is the importance that the spatial area is covered by the model e.g. local or regional and whether it accounts for impacts beyond the study area in any way. The approach should make clear how the redistribution of economic activity and of households is estimated and modelled.</p> <p>In addition, the method should explain how the displacement of the activities that move to the places benefitting from</p> |          |   |          |

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|  | <p>transport investment has been estimated and modelled. The method should also demonstrate to what extent displacement takes place <i>within</i> the study area and the impacts of this and whether the regions outside the study area from which economic activity is displaced identified.</p> <p>Finally, the models tend to deal with economic impacts (costs and benefits) that materialise over different time periods. The model needs to compare impacts of a particular intervention over different timescales, including the discounting which is applied to ensure like for like comparisons. A consistent approach is therefore required to ensure impacts associated with a particular scheme and its performance can be compared on a like-for-like basis.</p> |          |   |
| Does the method take account of, and include estimates for, the impact of the transport proposal on other geographical areas outside the area that is under consideration?             | No  | Yes<br>✓ | Comment: The Wider Impacts analysis is very much focussed on the impacts in the regeneration area alone. However, the EALI is designed to understand the impacts at a gross and net level, including positive and negative distributional impacts (as well as the economic role of those affected e.g. businesses, workers, tourists etc and the behavioural response to the introduction of the scheme). The distribution of impacts is a key aspect of the EALI analysis.                                   |
| Does the method have a robust approach to estimating additionality and displacement of economic activity?  | No  | Yes<br>✓ | Comment: The estimation of displacement and additionality is important to analysing impacts at the sub-national level. The evidence to support the analysis of additionality and displacement is gathered through the detailed surveys carried out as part of the evidence gathering exercise. .  |
| Does the method apply an appropriate approach to discounting impacts that are generated in future years?   | No<br>✓   | Yes      | Comment: No discounting is applied in this approach. In principle, the method could apply a similar approach to discounting as in the CBA i.e. by creating a flow of impacts over time and then discounting these to a present value using the HMT discount rate. However, while this is straightforward in terms of output, it raises difficulties when applied to employment / jobs. Specific guidance would be required on this e.g. how to discount a FTE which equates to 10 person years of employment. |
| <b>Non-economic Impacts</b>  |   |          |   |
| Does the economic or any other analysis identify other impacts such as the environment and non-work / social, which might have an impact on the location of households and employment? | No<br>✓   | Yes      | Comment: The focus is on economic outputs. However, other social factors can be considered if the objectives of the scheme are to impact on deprivation or particular socially disadvantaged groups.  |
| What account has been taken of the possible indirect effects on economic output, and is robust evidence provided and explained of  | Comment: Guidance is provided on the need to understand, and provide the evidence base for, secondary impacts that may be generated by the transport investment and help support economic development eg attracting office or retail developments to the area. However, evidence should be provided to demonstrate how the economic development or regeneration   |          |   |

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| these impacts?  | outcomes can be attributed to the transport scheme. This could include, for example, discussion of why the market alone will not address the regeneration objectives. |          |  |
| <b>Implementability</b>   |   |          |  |
| Does the method include clear and accurate guidance on its implementation and any limitations with its use that users should be aware of? | No  | Yes<br>✓ | Comment: The approach is not one that has been developed by consultants or academics but is one that is set out in national transport appraisal guidance documents with much research supporting its development. It could therefore be easily rolled out for wider use. There are also no intellectual property rights or significant resource requirements required for continued maintenance or development as these could be provided by government and stored and updated centrally similar to the current arrangements for transport cost benefit analysis guidance. In addition, the approach could be used in a proportionate and consistent way to assess the impact of relatively small schemes, particularly business cases developed in response to government funding schemes similar to Local Sustainable Transport Fund or Pinch Point funding. |

| <b>Local Economic Impact Method Assessment Summary Table</b>       |   |                     |                                |               |   |         |       |
|--|---|---------------------|--------------------------------|---------------|---|---------|-------|
| <b>Model / Method</b>  | There are a number of different types of approaches / methods being used to estimate the economic impact of a transport scheme. This includes relatively simplistic survey-based approaches to much more sophisticated computable general equilibrium (CGE) models. Each of these can have general strengths and weaknesses and it is important to understand at the outset the basis of the approach and type of method that has been adopted. This prior consideration will give an early indication of the potential strengths and limitations associated with the type of approach. |                     |                                |               |   |         |       |
| <b>Land Use Transport Interaction (LUTI)</b>                       | Business and / or individual surveys  | Wage Equation Model | Computable General Equilibrium | Dynamic Model | Land Use and Transport Integration (LUTI) | Unclear | Other |
| What type of <b>approach / method</b> has been used? (please tick) |   |                     |                                |               | ✓   |         |       |
| If other, comment:   |   |                     |                                |               |   |         |       |
|  |   |                     |                                |               |   |         |       |

| <b>Criteria</b>   |  |   |   |
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| <b>Consistency with Robust Economic Theory</b>  |  | <p>It is clear that the various approaches currently being used to assess the sub-national, regional or local impacts of a transport intervention are based on different fundamental economic relationships linking transport investment and impacts on economic activity.</p> <p>A good method will provide strong grounds, in terms of the underlying economic theory and principles that form the framework for the method, to support the case that a transport intervention will lead to an increase in economic activity. It will, for example, demonstrate how the transport improvement is expected to feed through to higher levels of economic activity / GDP e.g. reduction in input costs, increases in output and / or employment? These relationships should be adequately explained in the documentation as should any further initiatives necessary to deliver the increase in economic activity.</p> |   |
| Is there a clear explanation of the economic theory and principles that form the framework for the method?  |  | Yes   | <p>Comment: LUTI models have evolved over a number of years. They seek to represent the key drivers behind changes in land use, economics and demographics within the modelled area, which can vary from town / city to national level. The models themselves draw on theory, research and empirical evidence from across the urban and regional economic field, together with other related disciplines. As such they are not generally developed solely for the purpose of assessing the economic impact of transport proposals, although the mechanisms to do this are inherent within the models to some extent.</p>  |
| Are the relationships via which the transport intervention is expected to feed through to a change in economic activity consistent with robust economic theories? |  | Yes   | <p>Comment: The LUTI model is designed to interact with a transport model – sharing a common zones system, with transport cost data being passed to the LUTI model and population and employment data being passed from the LUTI model back to the transport model. This dynamic interaction is run over a number of forecast years. The transport costs are used within the LUTI model to develop accessibility indicators which themselves influence the location of development, population and employment.</p> <p>Transport costs are described as feeding the LUTI model in two key respects (i) changes in goods vehicle costs and the costs of travel on employers business – affecting costs per unit of trade leading to impacts on production / trade and</p> |

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|  |  |     | investment; and (ii) the costs of home based / employer's business travel – affecting accessibility and hence household and business location.   |
| <b>Empirical evidence</b>  | <p>Evidence should be presented to support the impact of the transport improvement on the local economy. However, the literature to date suggests that the evidence to support the claimed direct linkages between transport investment and impacts on economic activity is not conclusive.</p> <p>A good method will therefore provide evidence to support the claimed impacts of the scheme and also indicate the robustness and/or uncertainties of the evidence.</p> <p>It should also explain why the evidence is relevant to the study / analysis e.g. the same mode, the same local labour market conditions apply, similar area characteristics and sectoral mix, similar scale etc.</p> <p>A particular source of uncertainty can be the direction of causality. Many factors – for example, transport connectivity and employment density – are closely correlated and it is difficult to separate the cause and effect. The method should therefore recognise where this is a difficulty and provide supporting evidence to distinguish between cause and effect in its assumed economic relationships.</p> |     |  |
| Does the method provide a clear and appropriate description of the empirical evidence that supports the claimed impacts, and also indicate the robustness of, and uncertainties associated with, the evidence? | No   |     | Comment: The documentation which is generally produced to accompany LUTI models is highly technical in nature. The modelling of the relationship between transport cost changes and land use / demographic / economics is highly complex. It is therefore not straightforward to isolate key parameters within the model and find a source for these parameters. |
| Does the method provide a robust justification of why the evidence is relevant for specific types of study / analysis, and also explain if there are limitations associated with its use?                      | No   |     | Comment: See above. There is clear guidance on its use and limitations of the approach that users should be aware of.  |
| Does the method provide robust evidence for the claimed direction of causality between cause and effect of any claimed economic relationships e.g. the transport intervention and change in economic outcomes? | No   |     | Comment: Not specifically – since the LUTI model covers such a wide range of economic and spatial relationships. Of the papers considered as part of the review, some reference is made to academic papers etc from which LUTI models typically derive parameters or relationships.  |
| Are sensitivity tests provided that show the impact of changes in key assumptions and empirical estimates that are used?   |  | Yes | Comment: This would depend on the application in hand. An application can easily be accompanied by an extensive set of sensitivity tests to explore the key relationships and impact of different assumptions /; scenarios.  |
| <b>Sub-criteria - assessment of Land Use and Availability of Land</b>  | Conventional transport models generally assume a fixed land use and that transport improvements accrue to existing businesses only by increasing productivity through, for example, reducing travel costs and through benefits from  |     |  |

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|   | <p>agglomeration. Local economic impact models however can be based on the assumption of flexible land use and business/workforce relocation (to allow a move to more productive jobs and an increase in total employment in the study area). It is important to understand these assumptions and their robustness as many of the benefits claimed are due to entrants into the local labour market leading to increased productivity and growth.</p> <p>The method should also be clear whether assumptions about changes in land use have implications for the estimates of demand derived from the transport model if this is based on a different land use assumption.</p>   |          |                                |   |
| Does the method provide robust explanation of why land use is assumed to be fixed, flexible, or flexible with constraints?  | Fixed  | Flexible | Flexible with constraints<br>✓ | Comment: This is the key characteristic of this approach. In general land uses can respond to changes in transport cost / accessibility within the context of planning allocations as determined by local planning authorities.   |
| Does the method provide robust theoretical and empirical evidence for the claimed relationship between the transport intervention and the impact on the location of businesses and workers? |  |          |                                | Comment: No – a common criticism of LUTI models is their ‘black box’ nature.  |
| If the method assumes flexible land use, are estimates of changes in land use taken into account in the estimates of transport demand?  |  | Yes      |                                | Comment: Yes, land use changes are typically constrained by local planning allocations – LUTI models generally do take explicit account of planning policy. The impact of land use changes are typically passed back to the transport model in the form of zonal population and employment data which in turn produces forecast transport demand matrices. Information flows are therefore required between planning authorities and model developers / users. The fluid nature of the planning context can be problematic in this respect. |
| Are the assumptions about land use consistent with the relevant land use planning frameworks?   |  | Yes      |                                | Comment: Generally, yes planning policy is a key factor in the models – see above.  |
| <b>Sub-criteria - Labour Supply</b>   | <p>It is important that a method or model used can clearly explain the impact and assumptions on the supply of labour. Presenting a transparent account of the impacts on the labour supply will be crucial to the credibility of the method and results. For example, in estimating job / employment impacts, what assumptions are made about the supply of labour and how it contributes to higher levels of activity?</p> <p>The method should be clear whether the results are dependent on a supply of labour resource e.g. unemployed labour, and provide the evidence to demonstrate that this exists in the form assumed e.g. skilled or unskilled or whether an increases in the labour force are a result of relocation of workers from outside the study area and, if so, whether from other parts of the UK or abroad.</p> |          |                                |   |



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|  | <p>The model should also be clear about, if there is claimed additional output per person, what causes the increased output? Evidence should be provided to support this effect and that it is a cause of the transport improvement. The method should explain whether the increase in output is from 'real' agglomeration effects as measured through wider impacts guidance i.e. within the existing sectoral mix, or is the increase in output generated by productivity impacts brought about by a change in the sectoral mix with low value jobs shifting out of the study area and higher value ones moving in.</p> <p>A good method should therefore be clear whether the method assumes relocation of labour and / or business under the do-something option and where the labour supply has come.</p> |     |  |  |
| Does the method provide a robust case, consistent with theory and empirical evidence, of how the transport intervention is assumed to affect labour supply in the study area and how this contributes to higher levels of economic activity? |  | Yes |  | Comment: The labour supply is constrained (residents in work plus net in-commuting) to equal the labour demand, determined by the model's regional economic model. Transport improvements lead to changes in investment / production and hence an increased demand for labour. |
| <b>Sub-criteria - Elasticities</b>   | <p>A number of the approaches for calculating local economic impacts, and the results generated, are dependent on robust estimates of labour supply elasticities and the response of the workforce to changes in wages. A number also include elasticities of productivity with respect to effective density.</p> <p>It should also be made clear whether the elasticities used are evidence-based or whether there are possible limitations e.g. are the elasticities applicable to the occupations and/or geographic area that contribute to the increases in economic activity, and if not what are the implications?</p> <p>Information should be provided about the sensitivity of the estimated outcomes to uncertainties around the elasticity values and the extent of these uncertainties.</p>        |     |  |  |
| If the method is dependent upon elasticities, does the method explain the evidence upon which the elasticities are based?  | No   |     |  | Comment: Elasticities are not explicitly reported, and the evidence used to support the elasticities is not clear.   |
| Is the supporting evidence for these elasticities robustly based on empirical evidence and suitable for the specific use in which they are being applied?  | No   |     |  | Comment: See above   |
| Does the method clearly explain the uncertainties around the elasticity values, the extent of these uncertainties, and the impact that these uncertainties could have on estimates   | No   |     |  | Comment: See above   |

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| that are generated from the method of the economic activity impacts of a transport intervention?   |  |     |  |  |
| <b>Dependency on other factors</b>   | <p>It is important to understand whether the impacts predicted by the models are dependent on other factors occurring / complementing the transport investment. SACTRA concluded that additional, non-transport investment is generally required to deliver economic impacts. In addition, Eddington concluded that, in itself, transport investment may not create additional economic activity i.e. it is conditional on other factors, such as local market circumstances and labour market conditions. The method should therefore clearly explain whether the impacts on economic activity are dependent on the transport investment alone, or whether it is assumed to act as a catalyst for a number of other structural changes and market conditions in the local economy, e.g. flexible labour market, under-employment of land and capital, business capital, housing, business premises etc, and whether such assumptions are credibly supported by evidence.</p> <p>Also, it will be important that the non-transport factors that are needed to generate the impacts are made explicit, including their own benefits, costs and externalities. In addition, evidence should be provided to show that the non-transport impacts are likely to materialise. For example, by specifying any constraints on planning permission that might influence the level and location of development.</p> <p>If the method is dependent on other, non-transport factors materialising, the costs associated with these impacts should be included in the scheme assessment. In addition, these costs should include the impact of any local contribution to the scheme. It should also be clear whether method takes account of opportunity costs.</p> |     |  |  |
| Does the method explain whether the impacts estimated are dependent on other factors occurring / complementing the transport investment?                         |  | Yes | Comment. The forecasts produced by the model (i.e. comparing a Test Case with Reference Case) are solely due to changes in transport cost / accessibility resulting from the transport proposal under consideration. |  |
| Are the non-transport factors that are needed to generate the impacts made explicit, including estimates of their own benefits and costs included externalities? |  | Yes | Comment. The transport scheme under consideration may lead to increased levels of development or the redistribution of economic activity and population. The costs associated with these effects are not considered. |  |
| Is evidence provided that the non-transport factors are likely to materialise?   |  | Yes | Comment. No  |  |
| <b>Counterfactual / Do-minimum</b>   | <p>Any economic impact assessment implicitly or explicitly involves the comparison of a Test Case with a Do Minimum or Reference Case. Understanding this counterfactual is crucial to the assertion of whether an intervention is likely to have the estimated effect, particularly if there are other proposals or schemes included in the Do Minimum which could influence the</p>  |     |  |  |

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|  | <p>quantum of impacts of the proposal under consideration. It is important therefore that model users provide a clear explanation of a counterfactual so that there is transparency around the assumptions made with regard to the scenario where the proposed scheme is not introduced.</p> <p>It will also be important to understand whether the Do Minimum is comparable with the 'do-minimum' of the cost benefit analysis transport appraisal.</p> <p>A good method should therefore explain details of the counterfactual, particularly whether it is consistent with the do-minimum assumed in the CBA.</p>  |     |  |
| Does the method provide a clear explanation of the counterfactual so that there is transparency around the assumptions made with regard to the scenario where the proposed scheme is not introduced? |  | Yes | The approach needs a base case against which the policy option is tested as a matter of course.  |
| <b>Data Use and Availability</b>   |  |     |  |
|  | <p>Many of the methods / models are highly dependent on specific data requirements, particularly at the local or regional level eg local levels of labour productivity by sector. However, in many cases this data is not readily available, and it will therefore be important to understand these requirements and limitations of the approach if the data is not available.</p> <p>The extent to which the data which is best suited to the analysis has been used should be made clear, as should the reliance placed on data which has been used but is less than ideal, for example because it covers a wider or different geographical area on the grounds that the ideal data is not available. It should also explain whether there any limitations or weaknesses with the data used e.g. has proxy data been used and, if so, whether it has possible limitations.</p> |     |  |
| Does the method explain why the data that is used is best suited to the analysis?  |  | Yes | Comment: LUTI models are typically data hungry. The documentation is generally very detailed in terms of the input demographic and economic data used. |
| Does the method explain limitations or weaknesses associated with the data that is used, and identify how these could affect the analysis?   |  | Yes | Comment: There is clear guidance on the limitations of the approach that users need to be aware of.  |
| Is the data required for application of the method freely and readily available for the study area under consideration?  |  | Yes | Comment: A relatively large number of LUTI models have now been developed and the data sources required are well established.                          |
| <b>Uses and Limitations of the Method</b>  |  |     |  |
|  | <p>It is important to understand the limitations associated with the use of a particular method e.g. are there theoretical or empirical limitations with specific applications of the approach the approach and are the assumptions of the method not</p>  |     |  |

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|   | suitable for use for specific applications.   |  |   |
| Are the key limitations associated with applying the method clearly explained?  | No  |  | Comment: No.  |
| Are the assumptions associated with the approach clearly documented so that they are open to considering the suitability of the method for specific applications?   | No  |  | Comment: No, not specifically in relation to economic impacts.  |
| <b>Calibration and Validation</b>   | <p>A potential key issue for determining the suitability and robustness of the methods will be the calibration and validation of the models used.</p> <p>The terms 'calibration' and 'validation' are more generally associated with 'models' as opposed to 'approaches'. In a transport model context these terms are well understood in terms of (a) the models representing the present day observed situation, and (b) the models responses to certain changes in inputs (e.g. a fuel price increase) being within accepted and established ranges.</p> <p>In this case though, the modelled relationships are not well understood or accepted. In addition the complexity involved (i.e. the myriad of factors which affect the real economy) means that there is very little scope to 'validate' models against observed outcomes over time. For example, it is not possible to validate a land use model in the same way as a transport model. These models are built up from a large number of relationships which themselves have been derived via empirical or theoretical evidence.</p> <p>Instead this therefore comes back to the strength of the evidence used to support the key relationships being modelled. For example, the derivation of elasticities and the evidence produced to support these values is a key issue.</p> |  |   |
| Is the evidence used to support the key relationships that are included in the method consistent with robust theory and empirical evidence, such as the evidence used for the derivation of elasticities? | No  |  | Comment: Most of the calibration of LUTI models is 'secondary' in nature involving substantial measures of professional judgement and 'reasonableness' testing. It would be helpful if a bespoke document were produced which was focussed on the key logic chains with respect to economic impacts specifically, outlining the key parameters used and assumptions made. |
| <b>Compatibility with Transport Model and with Transport Appraisal</b>  | <p>It is important that assumptions in the method used to estimate the local economic impacts are consistent with the main transport modelling and transport appraisal assumptions. A good method should be clear that there are no contradictions between the two sets of assumptions e.g. are these the same as have been used in estimating the relationship between transport costs and output (or employment) from which the employment or productivity elasticities have been derived? Are all mode costs combined or analysed separately?</p>  |  |   |
| Are the assumptions in the method for   | Partially   |  | The main issue here is that of the land use assumption. It is generally   |

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| <p>estimating local economic impacts consistent with the main transport appraisal assumptions? If not, are any deviations in the assumptions soundly justified?</p>   |  |            | <p>accepted that a TEE analysis should be undertaken on the basis of a fixed land use between the Reference and Test cases.<br/>This clearly does create a potential inconsistency between a LUTI derived appraisal and a conventional appraisal.</p>  |
| <p><b>Metrics</b></p> <p>The different methods may present the outputs using different metrics. For example, some are presented in changes to GDP and / or GVA and / or employment. It may be that DfT or the decision makers for whom the analysis is being undertaken want the results to be presented using a particular metric, perhaps to allow comparison across projects.<br/>The output metrics used should be appropriate and meaningful in terms of meeting DfT requirements and informing policy decisions.</p>  |  |            |  |
| <p>Are the metrics reported by the method useful and appropriate for informing the relevant decision makers?</p>  |  | <p>Yes</p> | <p>Comment: There are different levels of LUTI models, depending on the scale of the study area, and whether a regional economic model component is included. The main parameter reported is the redistribution of employment which is available at the zonal level. Larger regional / multi regional models can forecast employment change between as well as within regions, together with regional GVA forecasts.</p> |
| <p><b>Winners and Losers and Spatial Distribution</b></p> <p>This is a key criterion in the assessment, as many economic impact assessments focus solely on the immediate area of impact, without differentiating between newly generated economic activity and activity which has been redistributed from outside of the study area. To meet DfT requirements the results should show the economic impact at the national level as well as the local / regional / sub-national level.<br/>The introduction of new or improved transport links can clearly have more than one impact between the areas they are connecting. For example, both areas could see improvements, or at least net improvements as different sectors within each area are affected positively or negatively. Alternatively, one area could gain at the expense of the other. Indeed, it is possible that the area intended to benefit could see a negative impact on economic activity under certain circumstances e.g. inefficient industry and labour market being exposed to outside competition – the so called two-way road effect.<br/>While there are no hard and fast rules on which areas would benefit or lose in response to a transport intervention, it is important to assess how the model takes account of the impacts outside the study area and explain how factors such as economic activity, labour market performance etc are affected outside the study area (if at all). Again the evidence base underlying this will be important.<br/>Implicit in this is the importance that the spatial area is covered by the model e.g. local or regional and whether it accounts for impacts beyond the study area in any way. The approach should make clear how the redistribution of economic activity and of households is estimated and modelled.</p> |  |            |  |

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|  | <p>In addition, the method should explain how the displacement of the activities that move to the places benefitting from transport investment has been estimated and modelled. The method should also demonstrate to what extent displacement takes place <i>within</i> the study area and the impacts of this and whether the regions outside the study area from which economic activity is displaced identified.</p> <p>Finally, the models tend to deal with economic impacts (costs and benefits) that materialise over different time periods. The model needs to compare impacts of a particular intervention over different timescales, including the discounting which is applied to ensure like for like comparisons. A consistent approach is therefore required to ensure impacts associated with a particular scheme and its performance can be compared on a like-for-like basis.</p> |     |  |
| Does the method take account of, and include estimates for, the impact of the transport proposal on other geographical areas outside the area that is under consideration?             |  | Yes | <p>Comment: Current LUTI models operate within a zero sum game across the area covered by the model. It is noted that variable sum model forms are being developed but are not currently in use.</p> <p>However a key strength of the LUTI approach is that ‘winners’ and ‘losers’ are clearly identified within the modelled area. For larger models this data can be presented at e.g. local authority level. This information has been used to make the case for transport schemes which provide benefits to lagging areas at the expense of more prosperous areas.</p> |
| Does the method have a robust approach to estimating additionality and displacement of economic activity?  |  | Yes | <p>Comment: Re-distributional impacts only within the study area.</p>  |
| Does the method apply an appropriate approach to discounting impacts that are generated in future years?   |  |     | <p>Comment: Not within the model but these discounts could be applied externally. Model outputs are available for each year within the forecast period.</p>  |
| <b>Non-economic Impacts</b>  |  |     |  |
| Does the economic or any other analysis identify other impacts such as the environment and non-work / social, which might have an impact on the location of households and employment? |  | Yes | <p>Comment: The model will provide forecasts of other socio economic effects such as the proportion of working age residents by zone and socio economic level who are working or not working. The models typically use a highly disaggregated breakdown of household type by car ownership level.</p>  |
| What account has been taken of the possible indirect effects on economic output, and is robust evidence provided and explained of these impacts?                                       | <p>Comment:</p>  |     |  |

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| <b>Implementability</b>   |  |     |   |
| Does the method include clear and accurate guidance on its implementation and any limitations with its use that users should be aware of? |  | Yes | Comment: The main limitation to LUTI approaches is the scale of investment required to create, operate and maintain such a model. The models can only realistically be created, operated and maintained by specialist firms without a major commitment from the purchaser. A separate transport forecasting model is also required. |

**Local Economic Impact Method Assessment Summary Table:**

|  |   |                     |                                |               |   |         |       |
|--|---|---------------------|--------------------------------|---------------|---|---------|-------|
| <b>Model / Method</b><br><b>Urban Dynamic Model</b>                | There are a number of different types of approaches / methods being used to estimate the economic impact at a sub-national level of a transport scheme. This includes relatively simplistic survey-based approaches to much more sophisticated computable general equilibrium (CGE) models. Each of these can have general strengths and weaknesses and it is important to understand at the outset the basis of the approach and type of method that has been adopted. This prior consideration will give an early indication of the potential strengths and limitations associated with the type of approach. |                     |                                |               |   |         |       |
|  | Business and / or individual surveys  | Wage Equation Model | Computable General Equilibrium | Dynamic Model | Land Use and Transport Integration (LUTI) | Unclear | Other |
| What type of <b>approach / method</b> has been used? (please tick) |   |                     |                                | ✓             |   |         |       |
| If other, comment:   |   |                     |                                |               |   |         |       |

**Criteria**

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| <b>Consistency with Robust Economic Theory</b> | <p>It is clear that the various approaches currently being used to assess the sub-national, regional or local impacts of a transport intervention are based on different fundamental economic relationships linking transport investment and impacts on economic activity.</p> <p>A good method will provide strong grounds, in terms of the underlying economic theory and principles that form the framework for the method, to support the case that a transport intervention will lead to an increase in economic activity. It will, for example, demonstrate how the transport improvement is expected to feed through to higher levels of economic activity / GDP e.g. reduction in input costs, increases in output and / or employment? These relationships should be</p> |
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| adequately explained in the documentation as should any further initiatives necessary to deliver the increase in economic activity.                                      |  |            |   |
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| <p>Is there a clear explanation of the economic theory and principles that form the framework for the method?</p>  |  | <p>Yes</p> | <p>Comment: All the UDM's transport models use standard transport modelling theories and mechanisms. The models underlying migration, construction and employers are based on simple stock and flow models that assume that the behaviour of people and employers is a lagged response to various measures of utility (referred to in the UDM as 'attractiveness' which is explained by the model owners to largely make the concept clearer to non-technical people). It is not based on advanced economic theories but is a simulation, showing how conditions change over time using fairly simple but robust assumptions about how individual and corporate decisions are made in response to conditions. These relationships seem to have been calibrated against observed data.</p>   |
| <p>Are the relationships via which the transport intervention is expected to feed through to a change in economic activity consistent with robust economic theories?</p> |  | <p>Yes</p> | <p>Comment: surveys of businesses asking why they chose their location consistently show the availability of labour and suitable premises (or the land on which to build new premises), plus good access to customers and suppliers are always among the top ranked factors. Common sense also tells us these must be requisites, although the relative importance of each obviously varies between business sectors. These are the factors employers respond to in the UDM. Transport affects the ability to recruit and access to customers and suppliers directly. It can affect the supply of premises indirectly if the initial boost in employment generates sufficient increase in demand to stimulate new office construction.</p> <p>The UDM constructs measures of the attractiveness of each zone for employers, based on the availability of each of these factors, distinguishing between categories of employer. Then</p> |



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|                                  |  |  | <p>it simply says if the attractiveness rises, more employers will arrive, the inflow will increase and the outflow diminish; if conditions worsen then the reverse will happen. Internal constraints and feedbacks such as labour availability will provide limits on how far this can go. The parameters governing this process were estimated in research for DfT ('The Impact of Transport on Business Location Decisions', reported in 2007, referred to subsequently as ITBLD) but are checked in each new implementation. There are no models of production functions, input-output functions etc, it simply takes the view that if local conditions are right, employers will take advantage of them.</p> <p>The UDM does not work with fixed totals of jobs, simply redistributing a fixed quantity across zones, but can generate varying totals. However it can also be based against existing projections of economic or population growth, such as might be available from econometric models. In these cases the projections are set up as targets for the model to grow into, usually by providing additional development land for housing or employment. The target growth may or not be achieved depending on internal conditions; in other words the economic growth projections are soft targets.</p> |
| <p><b>Empirical evidence</b></p> | <p>Evidence should be presented to support the impact of the transport improvement on the local economy. However, the literature to date suggests that the evidence to support the claimed direct linkages between transport investment and impacts on economic activity is not conclusive.</p> <p>A good method will therefore provide evidence to support the claimed impacts of the scheme and also indicate the robustness and/or uncertainties of the evidence.</p> <p>It should also explain why the evidence is relevant to the study / analysis e.g. the same mode, the same local labour market conditions apply, similar area characteristics and sectoral mix, similar scale etc.</p> <p>A particular source of uncertainty can be the direction of causality. Many factors – for example, transport connectivity and employment density – are closely correlated and it is difficult to separate the cause and effect. The method should therefore recognise where this is a difficulty and provide supporting evidence to distinguish between cause and effect in its assumed economic relationships.</p> |  |  |

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| Does the method provide a clear and appropriate description of the empirical evidence that supports the claimed impacts, and also indicate the robustness of, and uncertainties associated with, the evidence? |   | Yes           | Comment: Each application of the model is calibrated against observed data for the target area, both cross sectional and over time. Many of the parameters used in the business and employer model were estimated during the DfTITBLD study referred to above.  |  |
| Does the method provide a robust justification of why the evidence is relevant for specific types of study / analysis, and also explain if there are limitations associated with its use?                      |   | Yes           | Comment: The authors do explain why the assumptions used are relevant for the type of scheme(s) assessed. It is also explained that there may be weaknesses in its use for some types of intervention e.g. small schemes, although the model could be adapted to cover these.   |  |
| Does the method provide robust evidence for the claimed direction of causality between cause and effect of any claimed economic relationships e.g. the transport intervention and change in economic outcomes? |   | Yes           | Comment: The model is based on very explicit sequences of causality. This is strength of models of this type. The simplified causal loop diagram (reproduced in Chapter 4 of the main document) summarises the primary causal links in the UDM. Each causal link is fairly 'short', so there is little doubt over its direction of causality, but sequences of links can build up to generate feedback loops that can generate more complex behaviour. The classic one is that reducing transport costs can increase local activity, generating more traffic and increasing transport costs. (This can be traced in the loop diagram) |  |
| Are sensitivity tests provided that show the impact of changes in key assumptions and empirical estimates that are used?   |   | Yes           | Comment: There is no evidence in the examples provided of sensitivity tests being carried out. However, the model owners explain that these can be done, although in practice they are not commonly requested. The model's run times (30-45 minutes to simulate 20 years) mean that sensitivity tests are practical.  |  |
| <b>Sub-criteria - assessment of Land Use and Availability of Land</b>  | Conventional transport models generally assume a fixed land use and that transport improvements accrue to existing businesses only by increasing productivity through, for example, reducing travel costs and through benefits from agglomeration. Local economic impact models however can be based on the assumption of flexible land use and business/workforce relocation (to allow a move to more productive jobs and an increase in total employment in the study area). It is important to understand these assumptions and their robustness as many of the benefits claimed are due to entrants into the local labour market leading to increased productivity and growth.<br>The method should also be clear whether assumptions about changes in land use have implications for the estimates of demand derived from the transport model if this is based on a different land use assumption. |               |   |  |
| Does the method provide robust explanation of why land use is assumed to be fixed, flexible, or flexible with constraints?   | Fixed<br>✓  | Flexible<br>✓ | Flexible with constraints<br>✓  | Comment: all three options are available in the model. It is told how much land (in hectares) is available in each zone for employment use, how much is built on at the start and, by implication, how much is available for new development. As the simulation runs, land will be |

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|   |  |     | <p>built on as new premises are constructed, and released as they are demolished. Released land is assumed to return to the pool of available land. The total stock of land can be varied over time, so new land can be made available in future years to expand the pool available for construction. Premises are built at pre-determined densities, which vary by type of building and, if required, by location.</p> <p>A similar structure is used for housing.</p> <p>There is an option of using a single pool of land in each zone for both employment and housing, allowing the model to build whichever is most attractive to developers. The model owners explain that ,In practice, this has never been used because it is too far from how the UK planning system actually works.</p>                                       |
| Does the method provide robust theoretical and empirical evidence for the claimed relationship between the transport intervention and the impact on the location of businesses and workers? |  | Yes | Comment: The theory is largely expressed via the sequence of causal links. The formulation of the relationships used at each stage and their associated parameter values have been developed over a number of applications. ITBLD describes how the model was calibrated against time series data assembled for ten years.  |
| If the method assumes flexible land use, are estimates of changes in land use taken into account in the estimates of transport demand?  |  | Yes | Comment: Reduced transport costs will usually, for the reasons indicated above, increase attractiveness for employers, increasing demand for premises and labour. This may then make a zone more attractive for developers (which is indicated by a shortage of supply versus demand, and/or an increase in the availability of land, and/or evidence of local demand growth trends, all of which were identified in research with developers in the ITBLD work) which will increase construction rates. The availability of new premises will attract new employers which will generate new transport activity. New constraints, such as the availability of land for construction or labour for employers will, in time, limit the process, but the model will have generated changes in land use, employment and transport activity. |
| Are the assumptions about land use consistent with the relevant land use planning frameworks?   |  | Yes | Comment: New land allocations for employment and housing are set for future years using planning documents such as LDFs.  |
| <b>Sub-criteria - Labour Supply</b>   | It is important that a method or model used can clearly explain the impact and assumptions on the supply of labour. Presenting a transparent account of the impacts on the labour supply will be crucial to the credibility of the method and results. For example, in estimating job / employment impacts, what assumptions are made about the supply of labour and |     |   |

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|   | <p>how it contributes to higher levels of activity?<br/> The method should be clear whether the results are dependent on a supply of labour resource e.g. unemployed labour, and provide the evidence to demonstrate that this exists in the form assumed e.g. skilled or unskilled or whether an increases in the labour force are a result of relocation of workers from outside the study area and, if so, whether from other parts of the UK or abroad.</p> <p>The model should also be clear about, if there is claimed additional output per person, what causes the increased output? Evidence should be provided to support this effect and that it is a cause of the transport improvement. The method should explain whether the increase in output is from 'real' agglomeration effects as measured through wider impacts guidance i.e. within the existing sectoral mix, or is the increase in output generated by productivity impacts brought about by a change in the sectoral mix with low value jobs shifting out of the study area and higher value ones moving in.</p> <p>A good method should therefore be clear whether the method assumes relocation of labour and / or business under the do-something option and where the labour supply has come.</p> |            |   |
| <p>Does the method provide a robust case, consistent with theory and empirical evidence, of how the transport intervention is assumed to affect labour supply in the study area and how this contributes to higher levels of economic activity?</p> |  | <p>Yes</p> | <p>Comment: The balance between labour and employers is simulated carefully in the UDM, and is one of its strengths. The model simulates the in- and out-migration of households in each zone. Each household has a number of people in the workforce who are either in work or seeking work. Employers in each zone bring a number of 'posts' that they have to fill by recruitment. Employers recruit from the pool of accessible job-seekers available to them. Accessibility is a function of travel costs, taking into account all available modes. A deterrence function is used to model how the proportion of people willing to accept travel costs falls as those costs increase; this function is freshly calibrated for each new application using travel-to-work data from the Census. The pool of job seekers is made up of people who are unemployed plus people who are in work but are also looking for a new job. The model assumes people stay in work for an average period (sourced from ONS data) before moving into the employed-but-seeking category; this creates churn in the labour market. Reduced transport costs to a given zone will tend to increase the pool of accessible seekers available for employers located there. This means that in time more people will tend to work there (and the employers may respond by increasing the number of posts). As more people commute to that zone employers elsewhere may find it harder to recruit because of</p> |

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|  |   |     |   | <p>the increased competition for labour and there may be a reduction in employment in those zones. This can generate both a local increase in employment (in the target zone) but also redistribution as employers elsewhere contract, so the global effect is less than the local.</p> <p>The model recognises different classes of job skills, and will match employers' requirements to the skills possessed by the workforce. (In practice we usually use a small number of categories because in reality people and employers have a degree of flexibility.)</p> <p>If employment levels among the workforce in a zone rise, this will make the zone more attractive to live in, and increase net inward migration rates, so that the labour supply increases – subject to the availability of housing.</p> <p>One potential weakness is that the model appears to assume that the supply of labour has the necessary skills and qualifications required by employers, although there does appear to be a time lag to account for any mis-match of supply and demand in the short term i.e. markets are not 'perfect'.</p> |
| <b>Sub-criteria - Elasticities</b>   | <p>A number of the approaches for calculating local economic impacts, and the results generated, are dependent on robust estimates of labour supply elasticities and the response of the workforce to changes in wages. A number also include elasticities of productivity with respect to effective density.</p> <p>It should also be made clear whether the elasticities used are evidence-based or whether there are possible limitations e.g. are the elasticities applicable to the occupations and/or geographic area that contribute to the increases in economic activity, and if not what are the implications?</p> <p>Information should be provided about the sensitivity of the estimated outcomes to uncertainties around the elasticity values and the extent of these uncertainties.</p> |     |   |   |
| If the method is dependent upon elasticities, does the method explain the evidence upon which the elasticities are based?                  | No  |     | <p>Comment: The model does not use elasticities. However each new application is subjected to tests – such as changes to transport costs – that generate changes in behaviour from which implicit elasticities can be calculated. The model owners explain that these are checked against published evidence to make sure the model is behaving plausibly and consistent with evidence.</p> |   |
| Is the supporting evidence for these elasticities robustly based on empirical evidence and suitable for the specific use in which they are | No  | Yes | <p>Comment: N/A</p>   |   |

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| being applied?   |    |     |           |   |
| Does the method clearly explain the uncertainties around the elasticity values, the extent of these uncertainties, and the impact that these uncertainties could have on estimates that are generated from the method of the economic activity impacts of a transport intervention?  | No | Yes | Partially | Comment: N/A  |
| <p><b>Dependency on other factors</b></p> <p>It is important to understand whether the impacts predicted by the models are dependent on other factors occurring / complementing the transport investment. SACTRA concluded that additional, non-transport investment is generally required to deliver economic impacts. In addition, Eddington concluded that, in itself, transport investment may not create additional economic activity i.e. it is conditional on other factors, such as local market circumstances and labour market conditions. The method should therefore clearly explain whether the impacts on economic activity are dependent on the transport investment alone, or whether it is assumed to act as a catalyst for a number of other structural changes and market conditions in the local economy, e.g. flexible labour market, under-employment of land and capital, business capital, housing, business premises etc, and whether such assumptions are credibly supported by evidence.</p> <p>Also, it will be important that the non-transport factors that are needed to generate the impacts are made explicit, including their own benefits, costs and externalities. In addition, evidence should be provided to show that the non-transport impacts are likely to materialise. For example, by specifying any constraints on planning permission that might influence the level and location of development.</p> <p>If the method is dependent on other, non-transport factors materialising, the costs associated with these impacts should be included in the scheme assessment. In addition, these costs should include the impact of any local contribution to the scheme. It should also be clear whether method takes account of opportunity costs.</p> |    |     |           |   |
| Does the method explain whether the impacts estimated are dependent on other factors occurring / complementing the transport investment?   |    | Yes |           | Comment: In its normal mode of operation the model simulates responses to a transport investment without assuming additional factors being in place. By its nature the model generates a number of responses to any given transport investment, such as the changes to labour supply – locally and globally – as described above. These changes are concerned with how employers, developers and households – specifically the labour force – react, changing where they locate, work or build. The main additional factor that can be introduced in model runs is the availability of additional land for construction, which can greatly amplify the effects of transport investment. This of course is assumed to be the result of external policy decisions. Changes to employment law, the availability of capital |

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|  |  |  | etc are not explicitly recognised. Changes to labour force skills levels have been tested, by shifting proportions of the workforce from lower skill levels to higher, but this is not part of the normal model mechanism and has to be triggered by an external policy decision. In summary, the 'other factor' most commonly used is land-use policy, and this will always be made explicit. |   |
| Are the non-transport factors that are needed to generate the impacts made explicit, including estimates of their own benefits and costs included externalities?                                     |  | Yes  | n/a  | As stated above, they are made explicit. The costs of, for example, land reclamation are not taken into account because for the model's immediate purpose they are not required: the aim is to estimate the response to such interventions. Such costs could be taken into account separately in a full CBA, if required but this is outside the scope of the UDM's role. |
| Is evidence provided that the non-transport factors are likely to materialise?   |  |  | partially  | The internal changes are justified on the grounds that they are consistent with theory and the evidence of past years. Exogeneous changes (like land allocations) are justified with reference to planning documentation.   |
| <b>Counterfactual / Do-minimum</b>   |  |  |  |   |
|  |  | <p>Any economic impact assessment implicitly or explicitly involves the comparison of a Test Case with a Do Minimum or Reference Case. Understanding this counterfactual is crucial to the assertion of whether an intervention is likely to have the estimated effect, particularly if there are other proposals or schemes included in the Do Minimum which could influence the quantum of impacts of the proposal under consideration. It is important therefore that model users provide a clear explanation of a counterfactual so that there is transparency around the assumptions made with regard to the scenario where the proposed scheme is not introduced.</p> <p>It will also be important to understand whether the Do Minimum is comparable with the 'do-minimum' of the cost benefit analysis transport appraisal.</p> <p>A good method should therefore explain details of the counterfactual, particularly whether it is consistent with the do-minimum assumed in the CBA.</p> |  |   |
| Does the method provide a clear explanation of the counterfactual so that there is transparency around the assumptions made with regard to the scenario where the proposed scheme is not introduced? |  | Yes  |  | Comment: A baseline do-minimum' is always set up and used as a comparator. This will simulate events for the same time horizon as the test of schemes or investments.   |
| <b>Data Use and Availability</b>   |  |  |  |   |
|  |  | <p>Many of the methods / models are highly dependent on specific data requirements, particularly at the local or regional level e.g. local levels of labour productivity by sector. However, in many cases this data is not readily available, and it will therefore be important to understand these requirements and limitations of the approach if the data is not available.</p>   |  |   |

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|  | <p>The extent to which the data which is best suited to the analysis has been used should be made clear, as should the reliance placed on data which has been used but is less than ideal, for example because it covers a wider or different geographical area on the grounds that the ideal data is not available. It should also explain whether there any limitations or weaknesses with the data used e.g. has proxy data been used and, if so, whether it has possible limitations.</p> |     |           |  |
| Does the method explain why the data that is used is best suited to the analysis?  |   | Yes |           | Comment: The model uses data that supports the simulation process.   |
| Does the method explain limitations or weaknesses associated with the data that is used, and identify how these could affect the analysis? |   |     | Partially | Comment: It's not documented at any length but see below for a discussion.   |
| Is the data required for application of the method freely and readily available for the study area under consideration?                    |   |     | Partially | <p>Comment: The model owners explain that there are several categories of data required, some of it readily available while other data, such as that from the census, is out of date.</p> <ul style="list-style-type: none"> <li>• The first relates to what is on the ground in the base year: the housing stock, households and population, employers and jobs, land and so on. This can largely be sourced from NOMIS.</li> <li>• The second relates to the transport networks. For each new application, transport models may already exist that can be adapted and converted for internal use within the UDM, but this is rare. The reasons are, first, that a UDM model will usually cover a large geographic area, larger than many typical transport models that may have been built for a more local purpose; that public transport models, especially for buses, seem to be even rarer, particularly for a large geographic area; that walk and cycle are very rarely incorporated in such models, but they are in the UDM. These problems apply to any LUTI model, not just the UDM. The approach has been to take existing highways models and adapt and extend them using, for example, SATURN. Rail networks are usually built for the application, using transport modelling software such as Cube. Bus networks are modelled using matrices of generalised times and fares; they are constructed by a process of inference, using information about actual mode shares and the generalised times for highways. Walk and cycle generalised times</li> </ul> |



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|  |  |  |  | <p>are estimated similarly, based on observed mode shares.</p> <ul style="list-style-type: none"> <li>• Third, there is data about actual behaviour. For transport, existing information about speeds, modes shares and OD patterns is often patchy. The census travel-to-work data provides valuable information about commute ODs and mode shares, but this still relies on 2001 data and the model owners are still waiting for the 2011 census data to be released. The availability of flow data for other trip types – personal non-commute, business to business, goods vehicles etc – varies from one application to another, and may be sparse. Information about speeds is increasingly available via Trafficmaster, TomTom etc and this is used to ensure that the model is responding correctly to highways congestion. These data issues apply to all models of this type, not just the UDM.)</li> <li>• For non-transport behaviour two key measures are local unemployment rates and job vacancies. These are used to check that the model is handling recruitment correctly and reproducing the actual balance between labour supply and demand. This is sourced from NOMIS.</li> <li>• The do-minimum will recognise expected future land-use policy. This is sourced from LDFs and/or discussion with Districts.</li> </ul> |
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| <b>Uses and Limitations of the Method</b>   |    | It is important to understand the limitations associated with the use of a particular method e.g. are there theoretical or empirical limitations with specific applications of the approach the approach and are the assumptions of the method not suitable for use for specific applications. |           |   |
| Are the key limitations associated with applying the method clearly explained?  | No | Yes  | Partially | Comment: The scope of the model is explained in the documentation. (See also the final section on 'implementability'.)  |
| Are the assumptions associated with the approach clearly documented so that they are open to considering the suitability of the method for specific applications? |    |  | Partially | Comment: The primary relationships and sequences of cause and effect are explained. The precise nature of those relationships – the formulae used to express them and the parameters values used – are not always documented publically, largely to preclude releasing them to competitors. However it has been explained that they have been shared with clients if asked. |

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| <p><b>Calibration and Validation</b></p>   | <p>A potential key issue for determining the suitability and robustness of the methods will be the calibration and validation of the models used.</p> <p>The terms 'calibration' and 'validation' are more generally associated with 'models' as opposed to 'approaches'. In a transport model context these terms are well understood in terms of (a) the models representing the present day observed situation, and (b) the models responses to certain changes in inputs (e.g. a fuel price increase) being within accepted and established ranges.</p> <p>In this case though, the modelled relationships are not well understood or accepted. In addition the complexity involved (i.e. the myriad of factors which affect the real economy) means that there is very little scope to 'validate' models against observed outcomes over time. For example, it is not possible to validate a land use model in the same way as a transport model. These models are built up from a large number of relationships which themselves have been derived via empirical or theoretical evidence.</p> <p>Instead this therefore comes back to the strength of the evidence used to support the key relationships being modelled. For example, the derivation of elasticities and the evidence produced to support these values is a key issue.</p> |            |   |
| <p>Is the evidence used to support the key relationships that are included in the method consistent with robust theory and empirical evidence, such as the evidence used for the derivation of elasticities?</p> |   | <p>Yes</p> | <p>Comment: Each new implementation involves several stages of calibration and testing. To take advantage of the latest census travel-to-work data (which is still for 2001) a temporary version of the model is built for that year, using employment and population data for that year and, so far as possible, a transport model for that year (the minimum requirement is a highways model). This is used to calibrate the model's recruitment deterrence function and the mode share parameters. It can also be used to infer generalised cost matrices for bus and walk, in cases where there is no existing model. The UDM is run repeatedly with numbers of households and employers held fixed until it is capable of generating travel-to-work matrices and mode shares that match the census travel-to-work data.</p> <p>The model is then re-based to a more recent year, retaining the deterrence and mode-choice parameters derived from the census year model. The test is to show that it can reproduce conditions for that year, so far as there is evidence. Typically these will be: numbers of jobs and the size of the labour force; local unemployment rates; job vacancy rates; point-to-point traffic speeds or drive times; flow volumes (where known; there may be good estimates of the numbers of commuters arriving by rail or bus in a city centre, for example).</p> <p>A do-nothing baseline is set up to simulate events to a target future year. This generates results for each year. Tests are made of how the model responds to changes in travel times and costs and to changes in land-use policy, and the implied elasticities calculated</p> |

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|  |   |     | and compared to observed values. This is a check that the model's behaviour is consistent with the evidence.  |
| <b>Compatibility with Transport Model and with Transport Appraisal</b>   | It is important that assumptions in the method used to estimate the local economic impacts are consistent with the main transport modelling and transport appraisal assumptions. A good method should be clear that there are no contradictions between the two sets of assumptions e.g. are these the same as have been used in estimating the relationship between transport costs and output (or employment) from which the employment or productivity elasticities have been derived? Are all mode costs combined or analysed separately? |     |   |
| Are the assumptions in the method for estimating local economic impacts consistent with the main transport appraisal assumptions? If not, are any deviations in the assumptions soundly justified? |   | Yes | Comment: The transport model is fully internalised in the UDM, so is handled on a basis consistent with the economic effects.   |
| <b>Metrics</b>   | The different methods may present the outputs using different metrics. For example, some are presented in changes to GDP and / or GVA and / or employment. It may be that DfT or the decision makers for whom the analysis is being undertaken want the results to be presented using a particular metric, perhaps to allow comparison across projects. The output metrics used should be appropriate and meaningful in terms of meeting DfT requirements and informing policy decisions.   |     |   |
| Are the metrics reported by the method useful and appropriate for informing the relevant decision makers?  |   | Yes | <p>Comment: The model simulates a wide range of events and activities, so there is flexibility about what is reported. Typically a standardised spread sheet format has been used to summarise a range of statistics. These figures are all available by zone, but can also be aggregated upwards to more useful clusters of zones, such as Districts; there is complete flexibility about defining zone clusters. Figures are also reported as absolute values from a test and as an incremental change against the baseline case so it can quickly be seen what the effects of particular test have been.</p> <ul style="list-style-type: none"> <li>• Employment (i.e. the numbers of people in-post in each zone or zone cluster)</li> <li>• The GVA associated with that employment (calculated externally using tables of GVA multipliers that vary by job sector and location)</li> <li>• Residents of each zone or zone cluster that are in employment (i.e. in employment anywhere). Absolute figures and percentages are reported.</li> <li>• Numbers of households, people and workforce.</li> </ul> |

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|  |  |  | <ul style="list-style-type: none"> <li>• OD matrices by trip category, and mode. Travel-to-work, home-based non-TTW and business-to-business, including goods vehicles, are available.</li> <li>• Accessible jobs, as experienced by residents. (This is sometimes used as a measure of equity.)</li> <li>• Travel-to-work car-kilometres, by trip ends or origins.</li> <li>• CO<sub>2</sub> emissions. Calculated by an external module, based on vehicle-kilometres for cars and goods vehicles, and by passenger-kilometres for public transport. Projected changes in unit emission rates can be incorporated into this calculation.</li> <li>• User benefits. Calculated in an external module using information extracted from the UDM.</li> </ul> |
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| <p><b>Winners and Losers and Spatial Distribution</b></p> | <p>This is a key criterion in the assessment, as many economic impact assessments focus solely on the immediate area of impact, without differentiating between newly generated economic activity and activity which has been redistributed from outside of the study area. To meet DfT requirements the results should show the economic impact at the national level as well as the local / regional / sub-national level.</p> <p>The introduction of new or improved transport links can clearly have more than one impact between the areas they are connecting. For example, both areas could see improvements, or at least net improvements as different sectors within each area are affected positively or negatively. Alternatively, one area could gain at the expense of the other. Indeed, it is possible that the area intended to benefit could see a negative impact on economic activity under certain circumstances e.g. inefficient industry and labour market being exposed to outside competition – the so called two-way road effect.</p> <p>While there are no hard and fast rules on which areas would benefit or lose in response to a transport intervention, it is important to assess how the model takes account of the impacts outside the study area and explain how factors such as economic activity, labour market performance etc are affected outside the study area (if at all). Again the evidence base underlying this will be important.</p> <p>Implicit in this is the importance that the spatial area is covered by the model e.g. local or regional and whether it accounts for impacts beyond the study area in any way. The approach should make clear how the redistribution of economic activity and of households is estimated and modelled.</p> <p>In addition, the method should explain how the displacement of the activities that move to the places benefitting from transport investment has been estimated and modelled. The method should also demonstrate to what extent displacement takes place <i>within</i> the study area and the impacts of this and whether the regions outside the study area from which economic activity is displaced identified.</p> <p>Finally, the models tend to deal with economic impacts (costs and benefits) that materialise over different time periods. The model needs to compare impacts of a particular intervention over different timescales, including the discounting which is</p> |
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| applied to ensure like for like comparisons. A consistent approach is therefore required to ensure impacts associated with a particular scheme and its performance can be compared on a like-for-like basis. |  |     |  |
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| Does the method take account of, and include estimates for, the impact of the transport proposal on other geographical areas outside the area that is under consideration?                                   |  | Yes | <p>Comment: It is explained that the model is always built to cover a larger area than the primary area of interest. This is to ensure at the very minimum that recruitment and travel to work catchments are properly captured and to avoid edge effects, where zones are only exposed to part of their real employment or business-to-business catchments. The usual arrangement is that zones covering the target area and a buffer ring around it will be simulated with 'full dynamics', meaning all the population and employer migration effects operating; zones beyond this will be operated with 'dynamics off', meaning that the total numbers of households and employers are held fixed (or are occasionally varied exogenously) but are available as pools of employment for residents of the target area to commute to, or of labour, for target area employers to recruit from. This arrangement avoids edge effects for the target area, and recognises that there will be movements of people and goods between the target and surrounding areas.</p>  |
| Does the method have a robust approach to estimating additionality and displacement of economic activity?  |  | Yes | <p>Comment: Yes, within the total area modelled. Economic activity will increase or diminish as the attractiveness of each zone varies. The availability of the labour force is one factor that affects the redistribution of activity, for reasons outlined above. (The text above read: <i>reduced transport costs to a given zone will tend to increase the pool of accessible seekers available for employers located there. This means that in time more people will tend to work there (and the employers may respond by increasing the number of posts). As more people commute to that zone employers elsewhere may find it harder to recruit because of the increased competition for labour and there may be a reduction in employment in those zones. This can generate both a local increase in employment (in the target zone) but also redistribution as employers elsewhere contract, so the global effect is less than the local.</i>)</p> <p>This redistribution will appear within the modelled area. No national UDM model has ever been built, but the total area covered is usually large enough to cover the majority of impacts. For example, the West Yorkshire model had a population of 2.3 million in the core West Yorkshire area, but 20.3m in the complete modelled area.</p> <p>It's worth pointing out that local authorities are primarily interested in what will happen in their area, and how to make local conditions as attractive as possible within their funding constraints. The UDM provides a good analysis of this. GIS plots have been used to show how patterns of employment, job numbers, access to employment opportunities,</p> |

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|  |   |          | recruitable workforce and other indicators develop in future years. These plots can be used to show how the relative advantages of locations change over time as, for example, congestion rises, and to identify potential remedies.   |
| Does the method apply an appropriate approach to discounting impacts that are generated in future years?   |   | possibly | Comment: All outputs are generated year by year, so discounts can be applied to reported outputs if required. There is no discounting involved in the internal simulation process.   |
| <b>Non-economic Impacts</b>  |   |          |  |
| Does the economic or any other analysis identify other impacts such as the environment and non-work / social, which might have an impact on the location of households and employment? | No  | Yes      | Comment: Household location decisions are affected by employment rates and the availability of housing. The condition of the housing stock can also be used, but in most applications this is turned off for lack of evidence to support the relationship. Employers' location decisions are affected by the ability to recruit a workforce with skills matched to their requirements, the availability of suitable premises, and access to customers and suppliers. Depending on the nature of the employer's activity, these might be other employers, or, in cases like education or health services, the size of the local population. For the retail sector the key measure is revenue per square metre floorspace. As with housing, the age (condition) of the premises can also be used, but in most cases this is turned off for lack of evidence. |
| What account has been taken of the possible indirect effects on economic output, and is robust evidence provided and explained of these impacts?                                       | Comment: If you mean second order effects, there are several implied by the feedback structure of the model. For example, if reduced transport costs generate increased numbers of employers in a given zone, this will then increase the pool of accessible customers and suppliers for employers located in that zone, which will further increase local attractiveness and the numbers of jobs. This is the UDM's representation of agglomeration. |          |  |
| <b>Implementability</b>  |   |          |  |
| Does the method include clear and accurate guidance on its implementation and any limitations with its use that users should be aware of?  |   | Yes      | Comment: The model requires specialist knowledge to implement, restricted to the developers of the model. There is extensive documentation about implementation at SDG but this is not in the public domain. IPR rests with the model owners. Once set up, models have been transferred to clients' offices. Input spreadsheets have been developed so that clients can carry out a range of tests themselves without consultant involvement. Nevertheless, to develop and maintain the model would require the specialist skills and knowledge of the model owners. The UDM is primarily intended for testing area-wide transport and land-use policy, in   |

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|  |  |  | order to understand how best to design policy and investment to boost employment. It is suited to areas with larger populations and complex patterns of activity. One would not build a UDM application to test a small scheme or a single development site, although having built it for some other reason it could be used to provide preliminary assessments of small schemes. |
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**Local Economic Impact Method Assessment Summary Table**

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| <b>Model / Method</b><br><b>KPMG Wage Equation Model</b>           | There are a number of different types of approaches / methods being used to estimate the economic impact of a transport scheme. This includes relatively simplistic survey-based approaches to much more sophisticated computable general equilibrium (CGE) models. Each of these can have general strengths and weaknesses and it is important to understand at the outset the basis of the approach and type of method that has been adopted. This prior consideration will give an early indication of the potential strengths and limitations associated with the type of approach. |                     |                                |               |   |         |       |
|  | Business and / or individual surveys  | Wage Equation Model | Computable General Equilibrium | Dynamic Model | Land Use and Transport Integration (LUTI) | Unclear | Other |
| What type of <b>approach / method</b> has been used? (please tick) |   | ✓                   |                                |               | Input / Output Model                      |         |       |
| If other, comment:   |   |                     |                                |               |   |         |       |

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| <b>Criteria</b>                                |  |
| <b>Consistency with Robust Economic Theory</b> | It is clear that the various approaches currently being used to assess the sub-national, regional or local impacts of a transport intervention are based on different fundamental economic relationships linking transport investment and impacts on economic activity.<br>A good method will provide strong grounds, in terms of the underlying economic theory and principles that form the framework for the method, to support the case that a transport intervention will lead to an increase in economic activity. It will, for example, demonstrate how the transport improvement is expected to feed through to higher levels of economic activity / GDP e.g. reduction in input costs, increases in output and / or employment? These relationships should be |

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|   | adequately explained in the documentation as should any further initiatives necessary to deliver the increase in economic activity.  |        |  |
| Is there a clear explanation of the economic theory and principles that form the framework for the method?  |  | Yes    | Comment: We have not seen a lot of material where the KPMG approach has been applied and the model owners did not respond to the request to engage in discussions. The analysis has therefore been restricted to published material only. However, the published material supporting the analysis of HSR is detailed and informative. The method developed by KPMG involves measuring the impact of two key elements. The first is productivity benefits generated through business time savings and agglomeration, consistent with conventional CBA. The second impact stems from the relocation of businesses and jobs to areas of higher productivity. We have not seen details of the application of a sub-national, regional or local scheme. |
| Are the relationships via which the transport intervention is expected to feed through to a change in economic activity consistent with robust economic theories? |  | Yes    | Comment: The approach and economic relationships are, in the main, sound. There are some issues with elasticities and causal relationships however, which are fundamental to the analysis. These are discussed below.  |
| <b>Empirical evidence</b>   | <p>Evidence should be presented to support the impact of the transport improvement on the local economy. However, the literature to date suggests that the evidence to support the claimed direct linkages between transport investment and impacts on economic activity is not conclusive.</p> <p>A good method will therefore provide evidence to support the claimed impacts of the scheme and also indicate the robustness and/or uncertainties of the evidence.</p> <p>It should also explain why the evidence is relevant to the study / analysis e.g. the same mode, the same local labour market conditions apply, similar area characteristics and sectoral mix, similar scale etc.</p> <p>A particular source of uncertainty can be the direction of causality. Many factors – for example, transport connectivity and employment density – are closely correlated and it is difficult to separate the cause and effect. The method should therefore recognise where this is a difficulty and provide supporting evidence to distinguish between cause and effect in its assumed economic relationships.</p> |        |  |
| Does the method provide a clear and appropriate description of the empirical evidence that supports the claimed impacts, and                                      |  | Partly | Comment: Some evidence is provided in the supporting technical report (such as the relationship between rail connectivity and productivity), but there are gaps in the evidence on some key areas, particularly the claims with regard to the causal   |



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| also indicate the robustness of, and uncertainties associated with, the evidence?  |  |               | relationships             |  |
| Does the method provide a robust justification of why the evidence is relevant for specific types of study / analysis, and also explain if there are limitations associated with its use?                      | No   |               |                           | Comment: There is no discussion around the limitations of the approach under particular circumstances e.g. either by mode or spatial coverage  |
| Does the method provide robust evidence for the claimed direction of causality between cause and effect of any claimed economic relationships e.g. the transport intervention and change in economic outcomes? | No   |               |                           | Comment: The assumptions with regard to causal relationships are perhaps the main weakness in the analysis. KPMG found that areas with higher levels of rail connectivity have higher levels of productivity (i.e. wages). They claim that the latter is a consequence of the former when it may be the opposite, or at the very least a two-way relationship with rail connectivity impacting on productivity and productivity influencing rail connectivity. KPMG also claim a link between rail connectivity and employment density, in terms of jobs per sq metre, with the causality running from the former to the latter. Again, however, there is no empirical evidence to support this one-way direction of causation. The possibility of a two-way relationship would have a significant impact on the results and robustness of the work. |
| Are sensitivity tests provided that show the impact of changes in key assumptions and empirical estimates that are used?   | No   |               |                           | Comment: No sensitivity tests carried out, although the analysis seen has been limited to the Greengauge 21 High Speed Rail analysis.  |
| <b>Sub-criteria - assessment of Land Use and Availability of Land</b>  | Conventional transport models generally assume a fixed land use and that transport improvements accrue to existing businesses only by increasing productivity through, for example, reducing travel costs and through benefits from agglomeration. Local economic impact models however can be based on the assumption of flexible land use and business/workforce relocation (to allow a move to more productive jobs and an increase in total employment in the study area). It is important to understand these assumptions and their robustness as many of the benefits claimed are due to entrants into the local labour market leading to increased productivity and growth. The method should also be clear whether assumptions about changes in land use have implications for the estimates of demand derived from the transport model if this is based on a different land use assumption. |               |                           |  |
| Does the method provide robust explanation of why land use is assumed to be fixed, flexible, or flexible with constraints?   | Fixed  | Flexible<br>✓ | Flexible with constraints | Comment: A key feature of the approach by KPMG is less rigid assumptions about land use, compared to conventional transport CBA, and the impact the relocation of businesses can have on increased productivity and growth.  |
| Does the method provide robust theoretical and   | No   | Yes           | Partial                   | Comment: There is a brief discussion about the historical impact of  |

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| empirical evidence for the claimed relationship between the transport intervention and the impact on the location of businesses and workers?   |   |     | ✓   | railways on business and employer location, but no empirical evidence to support the claimed direction of causation.   |
| If the method assumes flexible land use, are estimates of changes in land use taken into account in the estimates of transport demand?   | No  | Yes | Comment: It is not clear from the report.   |  |
| Are the assumptions about land use consistent with the relevant land use planning frameworks?  | No  | Yes | Comment: The assumptions about land use are unclear. Admittedly, in the example looked at, consideration of all affected local planning applications could be difficult given the example looked at considered the impact of a national high speed rail scheme. |  |
| <b>Sub-criteria - Labour Supply</b>  | <p>It is important that a method or model used can clearly explain the impact and assumptions on the supply of labour. Presenting a transparent account of the impacts on the labour supply will be crucial to the credibility of the method and results. For example, in estimating job / employment impacts, what assumptions are made about the supply of labour and how it contributes to higher levels of activity?</p> <p>The method should be clear whether the results are dependent on a supply of labour resource e.g. unemployed labour, and provide the evidence to demonstrate that this exists in the form assumed e.g. skilled or unskilled or whether an increases in the labour force are a result of relocation of workers from outside the study area and, if so, whether from other parts of the UK or abroad.</p> <p>The model should also be clear about, if there is claimed additional output per person, what causes the increased output? Evidence should be provided to support this effect and that it is a cause of the transport improvement. The method should explain whether the increase in output is from 'real' agglomeration effects as measured through wider impacts guidance i.e. within the existing sectoral mix, or is the increase in output generated by productivity impacts brought about by a change in the sectoral mix with low value jobs shifting out of the study area and higher value ones moving in.</p> <p>A good method should therefore be clear whether the method assumes relocation of labour and / or business under the do-something option and where the labour supply has come.</p> |     |   |  |
| Does the method provide a robust case, consistent with theory and empirical evidence, of how the transport intervention is assumed to affect labour supply in the study area and how this contributes to higher levels of economic activity? |   | Yes |   | Comment: The issue of how rail connectivity impacts on the productivity of labour is a key feature of the model. It provides a strong case of how the transport intervention is assumed to affect labour supply and how this contributes to higher levels of productivity, employment and economic growth. |
| <b>Sub-criteria - Elasticities</b>   | A number of the approaches for calculating local economic impacts, and the results generated, are dependent on robust   |     |   |  |

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|  | <p>estimates of labour supply elasticities and the response of the workforce to changes in wages. A number also include elasticities of productivity with respect to effective density.</p> <p>It should also be made clear whether the elasticities used are evidence-based or whether there are possible limitations e.g. are the elasticities applicable to the occupations and/or geographic area that contribute to the increases in economic activity, and if not what are the implications?</p> <p>Information should be provided about the sensitivity of the estimated outcomes to uncertainties around the elasticity values and the extent of these uncertainties.</p>  |            |  |
| <p>If the method is dependent upon elasticities, does the method explain the evidence upon which the elasticities are based?</p>   |  | <p>Yes</p> | <p>Comment: Evidence is provided, but it is not conclusive and is one of the weaknesses with the method – see above.</p>   |
| <p>Is the supporting evidence for these elasticities robustly based on empirical evidence and suitable for the specific use in which they are being applied?</p>   | <p>No</p>  |            | <p>Comment: A key factor in the analysis is the responsiveness of productivity (wages) to rail connectivity, as well as employment density to rail connectivity. They estimate an elasticity of 0.11 i.e. an area with 10% better rail connectivity (business to business) will have wage levels which are 1.1% higher. As mentioned above, however, there is no hard evidence to support the causal relationship.</p> |
| <p>Does the method clearly explain the uncertainties around the elasticity values, the extent of these uncertainties, and the impact that these uncertainties could have on estimates that are generated from the method of the economic activity impacts of a transport intervention?</p> | <p>No</p>  |            | <p>Comment: The Technical report supporting the analysis acknowledges that the assumption that there is a causal relationship between rail connectivity and productivity needs further exploration and a different assumption would produce ‘significantly different results’.</p>   |
|  |  |            |  |
| <p><b>Dependency on other factors</b></p>  | <p>It is important to understand whether the impacts predicted by the models are dependent on other factors occurring / complementing the transport investment. SACTRA concluded that additional, non-transport investment is generally required to deliver economic impacts. In addition, Eddington concluded that, in itself, transport investment may not create additional economic activity i.e. it is conditional on other factors, such as local market circumstances and labour market conditions. The method should therefore clearly explain whether the impacts on economic activity are dependent on the transport investment alone, or whether it is assumed to act as a catalyst for a number of other structural changes and market conditions in the local economy, e.g. flexible labour market, under-employment of land and capital, business capital, housing, business premises etc, and whether such assumptions are credibly supported by evidence.</p> <p>Also, it will be important that the non-transport factors that are needed to generate the impacts are made explicit, including their own benefits, costs and externalities. In addition, evidence should be provided to show that the non-transport impacts</p> |            |  |

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|  | <p>are likely to materialise. For example, by specifying any constraints on planning permission that might influence the level and location of development.</p> <p>If the method is dependent on other, non-transport factors materialising, the costs associated with these impacts should be included in the scheme assessment. In addition, these costs should include the impact of any local contribution to the scheme. It should also be clear whether method takes account of opportunity costs.</p>   |  |  |
| Does the method explain whether the impacts estimated are dependent on other factors occurring / complementing the transport investment?   | No   |  | Comment: the method is clearly dependent on other factors occurring e.g. business premises being available for firms to move into and the supply of labour has the necessary skills and qualifications to generate the productivity improvements. However these assumptions are not discussed or evidence provided to support the assumptions. |
| Are the non-transport factors that are needed to generate the impacts made explicit, including estimates of their own benefits and costs included externalities?                                     | No   |  | Comment: The non-transport factors needed are not made explicit, particularly those on the labour supply, and the costs associated with the impacts needed to ensure the transport benefits materialise are not taken into account.  |
| Is evidence provided that the non-transport factors are likely to materialise?   | No   |  | Comment  |
| <b>Counterfactual / Do-minimum</b>   |  |  |  |
|  | <p>Any economic impact assessment implicitly or explicitly involves the comparison of a Test Case with a Do Minimum or Reference Case. Understanding this counterfactual is crucial to the assertion of whether an intervention is likely to have the estimated effect, particularly if there are other proposals or schemes included in the Do Minimum which could influence the quantum of impacts of the proposal under consideration. It is important therefore that model users provide a clear explanation of a counterfactual so that there is transparency around the assumptions made with regard to the scenario where the proposed scheme is not introduced.</p> <p>It will also be important to understand whether the Do Minimum is comparable with the 'do-minimum' of the cost benefit analysis transport appraisal.</p> <p>A good method should therefore explain details of the counterfactual, particularly whether it is consistent with the do-minimum assumed in the CBA.</p> |  |  |
| Does the method provide a clear explanation of the counterfactual so that there is transparency around the assumptions made with regard to the scenario where the proposed scheme is not introduced? | No   |  | Unclear: No clear explanation of the counterfactual is provided  |
| <b>Data Use and Availability</b>   |  |  |  |
|  | Many of the methods / models are highly dependent on specific data requirements, particularly at the local or regional level   |  |  |

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|   | <p>e.g. local levels of labour productivity by sector. However, in many cases this data is not readily available, and it will therefore be important to understand these requirements and limitations of the approach if the data is not available.</p> <p>The extent to which the data which is best suited to the analysis has been used should be made clear, as should the reliance placed on data which has been used but is less than ideal, for example because it covers a wider or different geographical area on the grounds that the ideal data is not available. It should also explain whether there any limitations or weaknesses with the data used e.g. has proxy data been used and, if so, whether it has possible limitations.</p> |     |           |   |
| Does the method explain why the data that is used is best suited to the analysis?   |   |     | Partially | Comment: The Technical Report provides a relatively detailed narrative on the data used; including some limitations e.g. wages data as a proxy for productivity, local socio-economic and planning data for each of the model zones.  |
| Does the method explain limitations or weaknesses associated with the data that is used, and identify how these could affect the analysis?                        |   |     | Partially | Comment: see above, also some socio-economic data not available at the required spatial e.g. local level  |
| Is the data required for application of the method freely and readily available for the study area under consideration?   |   |     | Partially | Comment: Some data available e.g. employment and workforce, but others not e.g. productivity at the individual and business level   |
| <b>Uses and Limitations of the Method</b>   | <p>It is important to understand the limitations associated with the use of a particular method e.g. are there theoretical or empirical limitations with specific applications of the approach the approach and are the assumptions of the method not suitable for use for specific applications.</p>   |     |           |   |
| Are the key limitations associated with applying the method clearly explained?  |   |     | Partially | Comment: The Technical Report provides a discussion on some of the weaknesses of the approach, particularly the direction of causality between rail connectivity and productivity and the fact that rail connectivity may be correlated to other factors that could possibly drive the performance of firms e.g. connectivity to other transport modes. |
| Are the assumptions associated with the approach clearly documented so that they are open to considering the suitability of the method for specific applications? |   | Yes |           | Comment: The assumptions are set out in the document or technical report  |
| <b>Calibration and Validation</b>   | <p>A potential key issue for determining the suitability and robustness of the methods will be the calibration and validation of the models used.</p>   |     |           |   |

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|  | <p>The terms ‘calibration’ and ‘validation’ are more generally associated with ‘models’ as opposed to ‘approaches’. In a transport model context these terms are well understood in terms of (a) the models representing the present day observed situation, and (b) the models responses to certain changes in inputs (e.g. a fuel price increase) being within accepted and established ranges.</p> <p>In this case though, the modelled relationships are not well understood or accepted. In addition the complexity involved (i.e. the myriad of factors which affect the real economy) means that there is very little scope to ‘validate’ models against observed outcomes over time. For example, it is not possible to validate a land use model in the same way as a transport model. These models are built up from a large number of relationships which themselves have been derived via empirical or theoretical evidence.</p> <p>Instead this therefore comes back to the strength of the evidence used to support the key relationships being modelled. For example, the derivation of elasticities and the evidence produced to support these values is a key issue.</p> |  |  |
| <p>Is the evidence used to support the key relationships that are included in the method consistent with robust theory and empirical evidence, such as the evidence used for the derivation of elasticities?</p> | <p>No</p>   |  | <p>Comment: The elasticities could be consistent with theory and evidence, but there are issues around the causal relationships.</p>                                     |
|  |   |  |  |
| <p><b>Compatibility with Transport Model and with Transport Appraisal</b></p>  | <p>It is important that assumptions in the method used to estimate the local economic impacts are consistent with the main transport modelling and transport appraisal assumptions. A good method should be clear that there are no contradictions between the two sets of assumptions e.g. are these the same as have been used in estimating the relationship between transport costs and output (or employment) from which the employment or productivity elasticities have been derived? Are all mode costs combined or analysed separately?</p>  |  |  |
| <p>Are the assumptions in the method for estimating local economic impacts consistent with the main transport appraisal assumptions? If not, are any deviations in the assumptions soundly justified?</p>        |   |  | <p>Partially</p> <p>Comment: It is not entirely clear, but there does appear to be consistency with the MVA work carried out on the CBA for HSR, <i>Fast Forward</i></p> |
|  |   |  |  |
| <p><b>Metrics</b></p>  | <p>The different methods may present the outputs using different metrics. For example, some are presented in changes to GDP and / or GVA and / or employment. It may be that DfT or the decision makers for whom the analysis is being undertaken want the results to be presented using a particular metric, perhaps to allow comparison across projects.</p> <p>The output metrics used should be appropriate and meaningful in terms of meeting DfT requirements and informing policy decisions.</p>   |  |  |

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| Are the metrics reported by the method useful and appropriate for informing the relevant decision makers?  |   | Yes | Comment: The metrics are useful i.e. changes in employment and GVA, although the figures are presented at 2040  |
| <b>Winners and Losers and Spatial Distribution</b>   | <p>This is a key criterion in the assessment, as many economic impact assessments focus solely on the immediate area of impact, without differentiating between newly generated economic activity and activity which has been redistributed from outside of the study area. To meet DfT requirements the results should show the economic impact at the national level as well as the local / regional / sub-national level.</p> <p>The introduction of new or improved transport links can clearly have more than one impact between the areas they are connecting. For example, both areas could see improvements, or at least net improvements as different sectors within each area are affected positively or negatively. Alternatively, one area could gain at the expense of the other. Indeed, it is possible that the area intended to benefit could see a negative impact on economic activity under certain circumstances e.g. inefficient industry and labour market being exposed to outside competition – the so called two-way road effect.</p> <p>While there are no hard and fast rules on which areas would benefit or lose in response to a transport intervention, it is important to assess how the model takes account of the impacts outside the study area and explain how factors such as economic activity, labour market performance etc are affected outside the study area (if at all). Again the evidence base underlying this will be important.</p> <p>Implicit in this is the importance that the spatial area is covered by the model e.g. local or regional and whether it accounts for impacts beyond the study area in any way. The approach should make clear how the redistribution of economic activity and of households is estimated and modelled.</p> <p>In addition, the method should explain how the displacement of the activities that move to the places benefitting from transport investment has been estimated and modelled. The method should also demonstrate to what extent displacement takes place <i>within</i> the study area and the impacts of this and whether the regions outside the study area from which economic activity is displaced identified.</p> <p>Finally, the models tend to deal with economic impacts (costs and benefits) that materialise over different time periods. The model needs to compare impacts of a particular intervention over different timescales, including the discounting which is applied to ensure like for like comparisons. A consistent approach is therefore required to ensure impacts associated with a particular scheme and its performance can be compared on a like-for-like basis.</p> |     |   |
| Does the method take account of, and include estimates for, the impact of the transport proposal on other geographical areas outside the area that is under consideration? |   | Yes | Comment: The figures are presented at a national level, however there is no coverage of the re-distributional impacts and who would be the winners and losers |
| Does the method have a robust approach to  |   |     | Comment: Unclear. The analysis is carried out to estimate the national impacts of a   |

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| estimating additionality and displacement of economic activity?  |                                       |     | nationwide capital infrastructure transport scheme. There are instances of the model being used to estimate the impact of sub-national transport schemes, and these may tackle the issue of displacement, but these have not been made available as part of this study. |
| Does the method apply an appropriate approach to discounting impacts that are generated in future years?   |                                       | Yes | Comment: The figures appear to be estimated for a single future year i.e. 2040 in 2010 prices   |
| <b>Non-economic Impacts</b>  |                                       |     |   |
| Does the economic or any other analysis identify other impacts such as the environment and non-work / social, which might have an impact on the location of households and employment? | No                                    |     | Comment: The sole focus is on changes in GVA and employment   |
| What account has been taken of the possible indirect effects on economic output, and is robust evidence provided and explained of these impacts?                                       | Comment: This issue is not considered |     |   |
| <b>Implementability</b>  |                                       |     |   |
| Does the method include clear and accurate guidance on its implementation and any limitations with its use that users should be aware of?  | No                                    |     | Comment: Limited material seen to make a judgement, but perhaps only available with KPMG at the helm as it is likely to have intellectual property rights and the necessary information about the model to maintain.  |

### Local Economic Impact Method Assessment Summary Table:

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| <b>Model / Method</b><br><b>SERC Approach using Reduced Form Wage Equation and Structural Models</b> | There are a number of different types of approaches / methods being used to estimate the economic impact of a transport scheme. This includes relatively simplistic survey-based approaches to much more sophisticated computable general equilibrium (CGE) models. Each of these can have general strengths and weaknesses and it is important to understand at the outset the basis of the approach and type of method that has been adopted. This prior consideration will give an early indication of the potential strengths and limitations associated with the type of approach. |
|--|---|



|  | Business and / or individual surveys  | Wage Equation Model | Computable General Equilibrium  | Dynamic Model | Land Use and Transport Integration (LUTI)<br>Input / Output Model | Unclear | Other |
|--|---|---------------------|---|---------------|---|---------|-------|
| What type of <b>approach / method</b> has been used? (please tick)   |   | ✓                   |   |               |   |         | ✓     |
| If other, comment: The approach used by SERC to analyse the impact of strengthening economic linkages between Leeds and Manchester used two models. For one stage of the analysis (Agglomeration and Labour Markets) a reduced form wage equation model is used, similar to that used by KPMG. For the latter part of the analysis looking at the redistribution of the impacts under different scenarios a structural model was used based on trade theory. |   |                     |   |               |   |         |       |
| <b>Criteria</b>  |   |                     |   |               |   |         |       |
| <b>Consistency with Robust Economic Theory</b>   | <p>It is clear that the various approaches currently being used to assess the sub-national, regional or local impacts of a transport intervention are based on different fundamental economic relationships linking transport investment and impacts on economic activity.</p> <p>A good method will provide strong grounds, in terms of the underlying economic theory and principles that form the framework for the method, to support the case that a transport intervention will lead to an increase in economic activity. It will, for example, demonstrate how the transport improvement is expected to feed through to higher levels of economic activity / GDP e.g. reduction in input costs, increases in output and / or employment? These relationships should be adequately explained in the documentation as should any further initiatives necessary to deliver the increase in economic activity.</p> |                     |   |               |   |         |       |
| Is there a clear explanation of the economic theory and principles that form the framework for the method?   |   | Yes                 | <p>Comment: The theory and principles are set out in detail for both model types. The agglomeration benefits of increased productivity of the labour market are estimated using a reduced form wage equation model built on recognised agglomeration impacts, with the structural model based on principles set out in trade theory (heterogeneous firm model). The former is similar to that developed by KPMG, while the latter assumes that higher levels of integration from a new transport scheme generate productivity increases through higher levels of competition from new entrants to a market and increased trade with new markets</p> |               |   |         |       |
| Are the relationships via which the transport  |   | Yes                 | <p>Comment: See above. The relationships appear to be</p>   |               |   |         |       |

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| intervention is expected to feed through to a change in economic activity consistent with robust economic theories?  |  |     | consistent with the theories they are based on. The use of the structural model was preferred to a SCGE model as it better reflects the spatial impacts of a transport scheme   |
| <b>Empirical evidence</b>  | <p>Evidence should be presented to support the impact of the transport improvement on the local economy. However, the literature to date suggests that the evidence to support the claimed direct linkages between transport investment and impacts on economic activity is not conclusive.</p> <p>A good method will therefore provide evidence to support the claimed impacts of the scheme and also indicate the robustness and/or uncertainties of the evidence.</p> <p>It should also explain why the evidence is relevant to the study / analysis e.g. the same mode, the same local labour market conditions apply, similar area characteristics and sectoral mix, similar scale etc.</p> <p>A particular source of uncertainty can be the direction of causality. Many factors – for example, transport connectivity and employment density – are closely correlated and it is difficult to separate the cause and effect. The method should therefore recognise where this is a difficulty and provide supporting evidence to distinguish between cause and effect in its assumed economic relationships.</p> |     |   |
| Does the method provide a clear and appropriate description of the empirical evidence that supports the claimed impacts, and also indicate the robustness of, and uncertainties associated with, the evidence? |  | Yes | Comment: These are clearly set out in the report. The narrative also recognises the potential weaknesses in the analysis, particularly those related to the estimated elasticities and the evidence used to generate these. |
| Does the method provide a robust justification of why the evidence is relevant for specific types of study / analysis, and also explain if there are limitations associated with its use?                      |  | Yes | Comment:  |
| Does the method provide robust evidence for the claimed direction of causality between cause and effect of any claimed economic relationships e.g. the transport intervention and change in economic outcomes? |  | Yes | Comment: Where there are concerns about the causality this is acknowledged within the documentation   |
| Are sensitivity tests provided that show the impact of changes in key assumptions and empirical estimates that are used?   | No   |     | Comment:  |
| <b>Sub-criteria - assessment of Land Use and Availability of Land</b>  | Conventional transport models generally assume a fixed land use and that transport improvements accrue to existing businesses only by increasing productivity through, for example, reducing travel costs and through benefits from  |     |   |

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|   | <p>agglomeration. Local economic impact models however can be based on the assumption of flexible land use and business/workforce relocation (to allow a move to more productive jobs and an increase in total employment in the study area). It is important to understand these assumptions and their robustness as many of the benefits claimed are due to entrants into the local labour market leading to increased productivity and growth.</p> <p>The method should also be clear whether assumptions about changes in land use have implications for the estimates of demand derived from the transport model if this is based on a different land use assumption.</p>  |               |   |   |
| Does the method provide robust explanation of why land use is assumed to be fixed, flexible, or flexible with constraints?  | Fixed   | Flexible<br>✓ | Flexible with constraints   | Comment: Similarly to the KPMG approach, land use is assumed to be flexible in the model. |
| Does the method provide robust theoretical and empirical evidence for the claimed relationship between the transport intervention and the impact on the location of businesses and workers? |   | Yes           | Comment:  |   |
| If the method assumes flexible land use, are estimates of changes in land use taken into account in the estimates of transport demand?  | No  |               | Comment:  |   |
| Are the assumptions about land use consistent with the relevant land use planning frameworks?   | No  | Yes           | Comment: It is unclear whether consideration has been taken of the land use planning frameworks |   |
| <b>Sub-criteria - Labour Supply</b>   | <p>It is important that a method or model used can clearly explain the impact and assumptions on the supply of labour. Presenting a transparent account of the impacts on the labour supply will be crucial to the credibility of the method and results. For example, in estimating job / employment impacts, what assumptions are made about the supply of labour and how it contributes to higher levels of activity?</p> <p>The method should be clear whether the results are dependent on a supply of labour resource e.g. unemployed labour, and provide the evidence to demonstrate that this exists in the form assumed e.g. skilled or unskilled or whether an increases in the labour force are a result of relocation of workers from outside the study area and, if so, whether from other parts of the UK or abroad.</p> <p>The model should also be clear about, if there is claimed additional output per person, what causes the increased output? Evidence should be provided to support this effect and that it is a cause of the transport improvement. The method should explain whether the increase in output is from 'real' agglomeration effects as measured through wider impacts guidance i.e.</p> |               |   |   |

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|   | <p>within the existing sectoral mix, or is the increase in output generated by productivity impacts brought about by a change in the sectoral mix with low value jobs shifting out of the study area and higher value ones moving in.</p> <p>A good method should therefore be clear whether the method assumes relocation of labour and / or business under the do-something option and where the labour supply has come.</p>  |          |  |  |
| Does the method provide a robust case, consistent with theory and empirical evidence, of how the transport intervention is assumed to affect labour supply in the study area and how this contributes to higher levels of economic activity?  | No  | Yes<br>✓ | Unclear  | Comment:   |
| <b>Sub-criteria - Elasticities</b>  | <p>A number of the approaches for calculating local economic impacts, and the results generated, are dependent on robust estimates of labour supply elasticities and the response of the workforce to changes in wages. A number also include elasticities of productivity with respect to effective density.</p> <p>It should also be made clear whether the elasticities used are evidence-based or whether there are possible limitations e.g. are the elasticities applicable to the occupations and/or geographic area that contribute to the increases in economic activity, and if not what are the implications?</p> <p>Information should be provided about the sensitivity of the estimated outcomes to uncertainties around the elasticity values and the extent of these uncertainties.</p> |          |  |  |
| If the method is dependent upon elasticities, does the method explain the evidence upon which the elasticities are based?   |   | Yes      | Comment: The elasticities have been derived as part of the analysis. Evidence is provided to support the wage elasticity to rail accessibility and wage elasticity to road accessibility – the place based effect on productivity                      |  |
| Is the supporting evidence for these elasticities robustly based on empirical evidence and suitable for the specific use in which they are being applied?   |   | Yes      | Comment: The elasticities are similar to those derived elsewhere in similar studies. The authors acknowledge however that they may be too high as they have not been able to remove all forms of reverse causality regarding the people based effects. |  |
| Does the method clearly explain the uncertainties around the elasticity values, the extent of these uncertainties, and the impact that these uncertainties could have on estimates that are generated from the method of the economic activity impacts of a transport intervention? |   |          | Partially  | Comment: The weaknesses are acknowledged, but the impact of the uncertainties and therefore amended elasticities is not clear. |

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| <p><b>Dependency on other factors</b></p>   | <p>It is important to understand whether the impacts predicted by the models are dependent on other factors occurring / complementing the transport investment. SACTRA concluded that additional, non-transport investment is generally required to deliver economic impacts. In addition, Eddington concluded that, in itself, transport investment may not create additional economic activity i.e. it is conditional on other factors, such as local market circumstances and labour market conditions. The method should therefore clearly explain whether the impacts on economic activity are dependent on the transport investment alone, or whether it is assumed to act as a catalyst for a number of other structural changes and market conditions in the local economy, e.g. flexible labour market, under-employment of land and capital, business capital, housing, business premises etc, and whether such assumptions are credibly supported by evidence.</p> <p>Also, it will be important that the non-transport factors that are needed to generate the impacts are made explicit, including their own benefits, costs and externalities. In addition, evidence should be provided to show that the non-transport impacts are likely to materialise. For example, by specifying any constraints on planning permission that might influence the level and location of development.</p> <p>If the method is dependent on other, non-transport factors materialising, the costs associated with these impacts should be included in the scheme assessment. In addition, these costs should include the impact of any local contribution to the scheme. It should also be clear whether method takes account of opportunity costs.</p> |            |  |                                   |
| <p>Does the method explain whether the impacts estimated are dependent on other factors occurring / complementing the transport investment?</p>                         |  | <p>Yes</p> | <p>Comment: While the impacts are not necessarily dependent on other factors, part of the conclusions is that the benefits generated by the transport intervention will be greater if they are supported by structural changes, such as the composition / ability of the workforce</p> |                                   |
| <p>Are the non-transport factors that are needed to generate the impacts made explicit, including estimates of their own benefits and costs included externalities?</p> |  | <p>Yes</p> |  | <p>Comment: see comment above</p> |
| <p>Is evidence provided that the non-transport factors are likely to materialise?</p>   |  |            | <p>n/a</p>   | <p>Comment:</p>                   |
| <p><b>Counterfactual / Do-minimum</b></p>   | <p>Any economic impact assessment implicitly or explicitly involves the comparison of a Test Case with a Do Minimum or Reference Case. Understanding this counterfactual is crucial to the assertion of whether an intervention is likely to have the estimated effect, particularly if there are other proposals or schemes included in the Do Minimum which could influence the quantum of impacts of the proposal under consideration. It is important therefore that model users provide a clear explanation of a counterfactual so that there is transparency around the assumptions made with regard to the scenario where the proposed scheme is not introduced.</p>  |            |  |                                   |

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|  | <p>It will also be important to understand whether the Do Minimum is comparable with the 'do-minimum' of the cost benefit analysis transport appraisal.</p> <p>A good method should therefore explain details of the counterfactual, particularly whether it is consistent with the do-minimum assumed in the CBA.</p>   |     |           |   |
| Does the method provide a clear explanation of the counterfactual so that there is transparency around the assumptions made with regard to the scenario where the proposed scheme is not introduced? |  |     | Unclear   | Comment: It appears that the counterfactuals considered in this case are the do-something options. It is not clear what the do-nothing or do-minimum is.  |
| <b>Data Use and Availability</b>   | <p>Many of the methods / models are highly dependent on specific data requirements, particularly at the local or regional level e.g. local levels of labour productivity by sector. However, in many cases this data is not readily available, and it will therefore be important to understand these requirements and limitations of the approach if the data is not available.</p> <p>The extent to which the data which is best suited to the analysis has been used should be made clear, as should the reliance placed on data which has been used but is less than ideal, for example because it covers a wider or different geographical area on the grounds that the ideal data is not available. It should also explain whether there any limitations or weaknesses with the data used e.g. has proxy data been used and, if so, whether it has possible limitations.</p> |     |           |   |
| Does the method explain why the data that is used is best suited to the analysis?  |  |     | Partially | Comment: There is lengthy discussion on why certain data has been used and why other data has not, and its suitability to the approach / method.  |
| Does the method explain limitations or weaknesses associated with the data that is used, and identify how these could affect the analysis?   |  | Yes |           | Comment: In many cases weaknesses are discussed around the data and derived elasticities. Similarly to the other models reviewed, and to many transport models, the approach is very data intensive, a reflection of the use of micro-employment data in order to separate the people and place based effect discussed above. |
| Is the data required for application of the method freely and readily available for the study area under consideration?  |  | Yes |           | Comment: The data used in the models are all available from published sources.  |
| <b>Uses and Limitations of the Method</b>  | <p>It is important to understand the limitations associated with the use of a particular method e.g. are there theoretical or empirical limitations with specific applications of the approach the approach and are the assumptions of the method not suitable for use for specific applications.</p>  |     |           |   |
| Are the key limitations associated with applying the method clearly explained?   |  | Yes | Partially | Comment:  |

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| Are the assumptions associated with the approach clearly documented so that they are open to considering the suitability of the method for specific applications?  | No | Yes      | Partially | Comment:   |
| <p><b>Calibration and Validation</b></p> <p>A potential key issue for determining the suitability and robustness of the methods will be the calibration and validation of the models used.</p> <p>The terms ‘calibration’ and ‘validation’ are more generally associated with ‘models’ as opposed to ‘approaches’. In a transport model context these terms are well understood in terms of (a) the models representing the present day observed situation, and (b) the models responses to certain changes in inputs (e.g. a fuel price increase) being within accepted and established ranges.</p> <p>In this case though, the modelled relationships are not well understood or accepted. In addition the complexity involved (i.e. the myriad of factors which affect the real economy) means that there is very little scope to ‘validate’ models against observed outcomes over time. For example, it is not possible to validate a land use model in the same way as a transport model. These models are built up from a large number of relationships which themselves have been derived via empirical or theoretical evidence.</p> <p>Instead this therefore comes back to the strength of the evidence used to support the key relationships being modelled. For example, the derivation of elasticities and the evidence produced to support these values is a key issue.</p> |    |          |           |  |
| Is the evidence used to support the key relationships that are included in the method consistent with robust theory and empirical evidence, such as the evidence used for the derivation of elasticities?  | No | Yes<br>✓ |           | Comment: The elasticities are derived from detailed statistical analysis but there are weaknesses in the methodological approach which are recognised by the authors.. |
| <p><b>Compatibility with Transport Model and with Transport Appraisal</b></p> <p>It is important that assumptions in the method used to estimate the local economic impacts are consistent with the main transport modelling and transport appraisal assumptions. A good method should be clear that there are no contradictions between the two sets of assumptions e.g. are these the same as have been used in estimating the relationship between transport costs and output (or employment) from which the employment or productivity elasticities have been derived? Are all mode costs combined or analysed separately?</p>   |    |          |           |  |
| Are the assumptions in the method for estimating local economic impacts consistent with the main transport appraisal assumptions? If not, are any deviations in the assumptions  | No | Yes      | Partially | Comment: n/a   |

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| soundly justified?  |  |     |   |  |
| <b>Metrics</b>  | <p>The different methods may present the outputs using different metrics. For example, some are presented in changes to GDP and / or GVA and / or employment. It may be that DfT or the decision makers for whom the analysis is being undertaken want the results to be presented using a particular metric, perhaps to allow comparison across projects.</p> <p>The output metrics used should be appropriate and meaningful in terms of meeting DfT requirements and informing policy decisions.</p>  |     |   |  |
| Are the metrics reported by the method useful and appropriate for informing the relevant decision makers? |  | Yes | <p>Comment: The wage equation model provides estimates of changes in GDP generated by the transport intervention. In addition, the structural model is aimed at understanding the distribution of the impacts which is also of interest to decision makers.</p> |  |
| <b>Winners and Losers and Spatial Distribution</b>  | <p>This is a key criterion in the assessment, as many economic impact assessments focus solely on the immediate area of impact, without differentiating between newly generated economic activity and activity which has been redistributed from outside of the study area. To meet DfT requirements the results should show the economic impact at the national level as well as the local / regional / sub-national level.</p> <p>The introduction of new or improved transport links can clearly have more than one impact between the areas they are connecting. For example, both areas could see improvements, or at least net improvements as different sectors within each area are affected positively or negatively. Alternatively, one area could gain at the expense of the other. Indeed, it is possible that the area intended to benefit could see a negative impact on economic activity under certain circumstances e.g. inefficient industry and labour market being exposed to outside competition – the so called two-way road effect.</p> <p>While there are no hard and fast rules on which areas would benefit or lose in response to a transport intervention, it is important to assess how the model takes account of the impacts outside the study area and explain how factors such as economic activity, labour market performance etc are affected outside the study area (if at all). Again the evidence base underlying this will be important.</p> <p>Implicit in this is the importance that the spatial area is covered by the model e.g. local or regional and whether it accounts for impacts beyond the study area in any way. The approach should make clear how the redistribution of economic activity and of households is estimated and modelled.</p> <p>In addition, the method should explain how the displacement of the activities that move to the places benefitting from transport investment has been estimated and modelled. The method should also demonstrate to what extent displacement takes place <i>within</i> the study area and the impacts of this and whether the regions outside the study area from which economic activity is displaced identified.</p> <p>Finally, the models tend to deal with economic impacts (costs and benefits) that materialise over different time periods. The model needs to compare impacts of a particular intervention over different timescales, including the discounting which is</p> |     |   |  |



| applied to ensure like for like comparisons. A consistent approach is therefore required to ensure impacts associated with a particular scheme and its performance can be compared on a like-for-like basis. |                            |     |  |
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| Does the method take account of, and include estimates for, the impact of the transport proposal on other geographical areas outside the area that is under consideration?                                   |                            | Yes | Comment: The ability to estimate the distributional impacts is one of the main positive features of the approach. The SERC structural model was developed to estimate how the productivity impacts would extend beyond Leeds and Manchester and the level of displacement across different areas of the north of England. The wage equation model suggests that redistribution impacts can lead to significant increases in local GVA, while the structural model shows that there will be winners and losers, in terms of changes in GVA, at a local level. |
| Does the method have a robust approach to estimating additionality and displacement of economic activity?  |                            | Yes | Comment: While the wage equation model is not designed to analyse the distribution of impacts, this is the primary objective of the structural model and was specifically designed to understand the displacement impacts across the north of England of improving linkages between Leeds and Manchester.  |
| Does the method apply an appropriate approach to discounting impacts that are generated in future years?   | No                         |     | Comment: Discounting is not applied.   |
| <b>Non-economic Impacts</b>  |                            |     |  |
| Does the economic or any other analysis identify other impacts such as the environment and non-work / social, which might have an impact on the location of households and employment?                       | No                         |     | Comment: The main focus of the SERC analysis was to understand the economic impacts of improved linkages. Other factors are not considered.  |
| What account has been taken of the possible indirect effects on economic output, and is robust evidence provided and explained of these impacts?   | Comment: no account taken. |     |  |
| <b>Implementability</b>  |                            |     |  |
| Does the method include clear and accurate guidance on its implementation and any limitations with its use that users should be aware of?  | No                         | Yes | Comment: There is no guidance on its implementation. However, unlike many of the other models which were built as a commercial venture, the SERC wage equation and structural models were developed as part of an academic study. Consequently there may be fewer restrictions on its availability and use by other organisations, although this does  |

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|  |  |  | not necessarily mean it is easy to maintain and apply as the models are complex. In addition, the research team responsible for the models recognise that they would require further development for wider application as the evidence base supporting the model is currently weak and insufficient to support policy applications. |
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**Local Economic Impact Method Assessment Summary Table**

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| <b>Model / Method</b><br><b>Partial Equilibrium Volterra</b> | There are a number of different types of approaches / methods being used to estimate the economic impact of a transport scheme. This includes relatively simplistic survey-based approaches to much more sophisticated computable general equilibrium (CGE) models. Each of these can have general strengths and weaknesses and it is important to understand at the outset the basis of the approach and type of method that has been adopted. This prior consideration will give an early indication of the potential strengths and limitations associated with the type of approach. |
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|  | Business and / or individual surveys | Wage Equation Model | Computable General Equilibrium | Dynamic Model | Land Use and Transport Integration (LUTI) | Unclear | Other                     |
|--|--------------------------------------|---------------------|--------------------------------|---------------|---|---------|---------------------------|
| What type of <b>approach / method</b> has been used? (please tick) |                                      |                     |                                |               |   |         | Partial equilibrium model |

If other, comment: This method used by Volterra / Buchannan's in their 2007 paper estimating the impacts of Crossrail derived from the analysis later published in the WebTAG Unit 3.5.14 guidance on Wider Impacts.

**Criteria**

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| <b>Consistency with Robust Economic Theory</b> | <p>It is clear that the various approaches currently being used to assess the sub-national, regional or local impacts of a transport intervention are based on different fundamental economic relationships linking transport investment and impacts on economic activity.</p> <p>A good method will provide strong grounds, in terms of the underlying economic theory and principles that form the framework for the method, to support the case that a transport intervention will lead to an increase in economic activity. It will, for example, demonstrate how the transport improvement is expected to feed through to higher levels of economic activity / GDP e.g. reduction in input costs, increases in output and / or employment? These relationships should be</p> |
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|  | adequately explained in the documentation as should any further initiatives necessary to deliver the increase in economic activity. |  |  |
| Is there a clear explanation of the economic theory and principles that form the framework for the method?   |   | Yes  | Comment: The approach is based on the theory of the effects of changes in transport generalised costs on agglomeration and the effects on labour supply and labour productivity.   |
| Are the relationships via which the transport intervention is expected to feed through to a change in economic activity consistent with robust economic theories?  |   | Yes  | Comment: See directly above ; relationships derived from evidence gathered on changes in transport costs and agglomeration theory and on labour market theory. This has been used to inform the wider impacts analysis used in conventional transport cost benefit analysis appraisal              |
| -<br><b>Empirical evidence</b>   | <b>Relationships</b>  | <p>Evidence should be presented to support the impact of the transport improvement on the local economy. However, the literature to date suggests that the evidence to support the claimed direct linkages between transport investment and impacts on economic activity is not conclusive.</p> <p>A good method will therefore provide evidence to support the claimed impacts of the scheme and also indicate the robustness and/or uncertainties of the evidence.</p> <p>It should also explain why the evidence is relevant to the study / analysis e.g. the same mode, the same local labour market conditions apply, similar area characteristics and sectoral mix, similar scale etc.</p> <p>A particular source of uncertainty can be the direction of causality. Many factors – for example, transport connectivity and employment density – are closely correlated and it is difficult to separate the cause and effect. The method should therefore recognise where this is a difficulty and provide supporting evidence to distinguish between cause and effect in its assumed economic relationships.</p> |  |
| Does the method provide a clear and appropriate description of the empirical evidence that supports the claimed impacts, and also indicate the robustness of, and uncertainties associated with, the evidence? |   | Yes  | Comment: Uses empirical evidence used to support Wider Impacts analysis. Where values or assumptions are used which differ from those used in WebTAG the reasons for opting for these values are given and evidence to support these values (e.g. comparisons with other capital cities) is given. |
| Does the method provide a robust justification of why the evidence is relevant for specific types of study / analysis, and also explain if there are limitations associated with its use?                      |   | Yes  | Comment: see above   |
| Does the method provide robust evidence for the claimed direction of causality between cause and   |   | Yes  | Comment: There is good evidence in WebTAG and in supporting papers for the causality of transport in the case of agglomeration benefits.   |

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| effect of any claimed economic relationships e.g. the transport intervention and change in economic outcomes?   |  |          | <p>The WebTAG labour supply elasticity is taken from literature on aggregate elasticity values. It does not relate specifically to a value estimated for the jobs/sectors that are typical of central London or other urban centre (in the case of the more general application outside London) sectors and jobs. Given that we might expect low paid jobs to be the more elastic to changes in the reward for working, it seems likely that the WebTAG elasticity is an over-estimate.</p> <p>The model used by V / B to estimate the extent of demand suppressed by crowding is plausible and the evidence quoted from different routes is convincing. It would be interesting to investigate this further, in particular against a framework which attributed increases in generalised costs to crowding and choice of clock-face time to travel.</p> |
| Are sensitivity tests provided that show the impact of changes in key assumptions and empirical estimates that are used?  |  | Yes      | Comment: Sensitivity tests are key to the analysis. Sensitivity tests to key assumptions are provided to understand the impact on the outputs.   |
| <b>Sub-criteria - assessment of Land Use and Availability of Land</b>   | <p>Conventional transport models generally assume a fixed land use and that transport improvements accrue to existing businesses only by increasing productivity through, for example, reducing travel costs and through benefits from agglomeration. Local economic impact models however can be based on the assumption of flexible land use and business/workforce relocation (to allow a move to more productive jobs and an increase in total employment in the study area). It is important to understand these assumptions and their robustness as many of the benefits claimed are due to entrants into the local labour market leading to increased productivity and growth.</p> <p>The method should also be clear whether assumptions about changes in land use have implications for the estimates of demand derived from the transport model if this is based on a different land use assumption.</p> |          |  |
| Does the method provide robust explanation of why land use is assumed to be fixed, flexible, or flexible with constraints?  |  | Flexible | Comment: The move to more productive jobs increases the number of workers in the areas served by Crossrail. However, no specific assumption is made about land use.  |
| Does the method provide robust theoretical and empirical evidence for the claimed relationship between the transport intervention and the impact on the location of businesses and workers? |  | Yes      | Comment: Firms and workers are attracted to locations where, because of the increase in effective density, they can be more productive.  |
| If the method assumes flexible land use, are estimates of changes in land use taken into account  | No   |          | Comment: See above   |

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| in the estimates of transport demand?  |   |     |   |
| Are the assumptions about land use consistent with the relevant land use planning frameworks?  | No  |     | Comment: There is no check on consistency, but it's not clear that the assumptions are inconsistent with what planners might approve with the scheme approved/in place. |
| <b>Sub-criteria - Labour Supply</b>  | <p>It is important that a method or model used can clearly explain the impact and assumptions on the supply of labour. Presenting a transparent account of the impacts on the labour supply will be crucial to the credibility of the method and results. For example, in estimating job / employment impacts, what assumptions are made about the supply of labour and how it contributes to higher levels of activity?</p> <p>The method should be clear whether the results are dependent on a supply of labour resource e.g. unemployed labour, and provide the evidence to demonstrate that this exists in the form assumed e.g. skilled or unskilled or whether an increases in the labour force are a result of relocation of workers from outside the study area and, if so, whether from other parts of the UK or abroad.</p> <p>The model should also be clear about, if there is claimed additional output per person, what causes the increased output? Evidence should be provided to support this effect and that it is a cause of the transport improvement. The method should explain whether the increase in output is from 'real' agglomeration effects as measured through wider impacts guidance i.e. within the existing sectoral mix, or is the increase in output generated by productivity impacts brought about by a change in the sectoral mix with low value jobs shifting out of the study area and higher value ones moving in.</p> <p>A good method should therefore be clear whether the method assumes relocation of labour and / or business under the do-something option and where the labour supply has come.</p> |     |   |
| Does the method provide a robust case, consistent with theory and empirical evidence, of how the transport intervention is assumed to affect labour supply in the study area and how this contributes to higher levels of economic activity? |   | Yes | Comment: labour moves to places where it can be more productive   |
| <b>Sub-criteria - Elasticities</b>   | <p>A number of the approaches for calculating local economic impacts, and the results generated, are dependent on robust estimates of labour supply elasticities and the response of the workforce to changes in wages. A number also include elasticities of productivity with respect to effective density.</p> <p>It should also be made clear whether the elasticities used are evidence-based or whether there are possible limitations e.g. are the elasticities applicable to the occupations and/or geographic area that contribute to the increases in economic activity, and if not what are the implications?</p> <p>Information should be provided about the sensitivity of the estimated outcomes to uncertainties around the elasticity values and the extent of these uncertainties.</p>   |     |   |
| If the method is dependent upon elasticities, does   |   | Yes | Comment: The method is based on two elasticities – the WebTAG productivity wrt  |

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| the method explain the evidence upon which the elasticities are based?  |  |     | effective density elasticity and an elasticity of unconstrained (by crowding) growth in commuting to C.London.                     |
| Is the supporting evidence for these elasticities robustly based on empirical evidence and suitable for the specific use in which they are being applied?   |  | Yes | Comment:WebTAG 3.5.14 and an elasticity of commuting growth and the effect of crowding, for which there is evidence in the report. |
| Does the method clearly explain the uncertainties around the elasticity values, the extent of these uncertainties, and the impact that these uncertainties could have on estimates that are generated from the method of the economic activity impacts of a transport intervention? |  | Yes | Comment: The report of the method sets out some sensitivity tests.   |
| <b>Dependency on other factors</b>  |  |     |  |
|   | <p>It is important to understand whether the impacts predicted by the models are dependent on other factors occurring / complementing the transport investment. SACTRA concluded that additional, non-transport investment is generally required to deliver economic impacts. In addition, Eddington concluded that, in itself, transport investment may not create additional economic activity i.e. it is conditional on other factors, such as local market circumstances and labour market conditions.</p> <p>The method should therefore clearly explain whether the impacts on economic activity are dependent on the transport investment alone, or whether it is assumed to act as a catalyst for a number of other structural changes and market conditions in the local economy, e.g. flexible labour market, under-employment of land and capital, business capital, housing, business premises etc, and whether such assumptions are credibly supported by evidence.</p> <p>Also, it will be important that the non-transport factors that are needed to generate the impacts are made explicit, including their own benefits, costs and externalities. In addition, evidence should be provided to show that the non-transport impacts are likely to materialise. For example, by specifying any constraints on planning permission that might influence the level and location of development.</p> <p>If the method is dependent on other, non-transport factors materialising, the costs associated with these impacts should be included in the scheme assessment. In addition, these costs should include the impact of any local contribution to the scheme.</p> <p>It should also be clear whether method takes account of opportunity costs.</p> |     |  |
| Does the method explain whether the impacts estimated are dependent on other factors occurring / complementing the transport  | No   |     | CommentNo assessment of other actors is provided. In this the approach follows WebTAG 3.5.14.                                      |

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| investment?  |  |     |   |
| Are the non-transport factors that are needed to generate the impacts made explicit, including estimates of their own benefits and costs included externalities?                                     | No   |     | Comment See above   |
| Is evidence provided that the non-transport factors are likely to materialise?   | No   |     | Comment See above   |
| <b>Counterfactual / Do-minimum</b>   |  |     |   |
|  | <p>Any economic impact assessment implicitly or explicitly involves the comparison of a Test Case with a Do Minimum or Reference Case. Understanding this counterfactual is crucial to the assertion of whether an intervention is likely to have the estimated effect, particularly if there are other proposals or schemes included in the Do Minimum which could influence the quantum of impacts of the proposal under consideration. It is important therefore that model users provide a clear explanation of a counterfactual so that there is transparency around the assumptions made with regard to the scenario where the proposed scheme is not introduced.</p> <p>It will also be important to understand whether the Do Minimum is comparable with the 'do-minimum' of the cost benefit analysis transport appraisal.</p> <p>A good method should therefore explain details of the counterfactual, particularly whether it is consistent with the do-minimum assumed in the CBA.</p> |     |   |
| Does the method provide a clear explanation of the counterfactual so that there is transparency around the assumptions made with regard to the scenario where the proposed scheme is not introduced? |  | Yes | No-Crossrail is the counterfactual, as in the standard WebTAG compliant appraisal.  |
| <b>Data Use and Availability</b>   |  |     |   |
|  | <p>Many of the methods / models are highly dependent on specific data requirements, particularly at the local or regional level e.g. local levels of labour productivity by sector. However, in many cases this data is not readily available, and it will therefore be important to understand these requirements and limitations of the approach if the data is not available. The extent to which the data which is best suited to the analysis has been used should be made clear, as should the reliance placed on data which has been used but is less than ideal, for example because it covers a wider or different geographical area on the grounds that the ideal data is not available. It should also explain whether there any limitations or weaknesses with the data used e.g. has proxy data been used and, if so, whether it has possible limitations.</p>  |     |   |
| Does the method explain why the data that is used is best suited to the analysis?  |  | Yes | Comment: The main sources of data, in addition to those provided in WebTAG, are comparisons with other world cities, cross-sectional and time series analysis of rail commuting flows and growth and local C. |

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|   |   |     |           | London GVA data   |
| Does the method explain limitations or weaknesses associated with the data that is used, and identify how these could affect the analysis?                        |   |     | Partially | Comment: The data set is well explained and so it's possible to make broad estimates of the implications of any uncertainty about the robustness of the data.                     |
| Is the data required for application of the method freely and readily available for the study area under consideration?   | No  |     |           | Comment: Train patronage and crowding data by corridor is not published by can be obtained from the train operators.  |
| <b>Uses and Limitations of the Method</b>   |   |     |           |   |
|   | It is important to understand the limitations associated with the use of a particular method e.g. are there theoretical or empirical limitations with specific applications of the approach the approach and are the assumptions of the method not suitable for use for specific applications.  |     |           |   |
| Are the key limitations associated with applying the method clearly explained?  | No  |     |           | Comment: The method is an extension of WebTAG and so the limitations are the same as WebTAG's.  |
| Are the assumptions associated with the approach clearly documented so that they are open to considering the suitability of the method for specific applications? |   | Yes |           | Comment: The method would seem to be suitable only for London where the constraints imposed by public transport crowding are a greater influence on overall levels of employment. |
| <b>Calibration and Validation</b>   |   |     |           |   |
|   | <p>A potential key issue for determining the suitability and robustness of the methods will be the calibration and validation of the models used.</p> <p>The terms 'calibration' and 'validation' are more generally associated with 'models' as opposed to 'approaches'. In a transport model context these terms are well understood in terms of (a) the models representing the present day observed situation, and (b) the models responses to certain changes in inputs (e.g. a fuel price increase) being within accepted and established ranges.</p> <p>In this case though, the modelled relationships are not well understood or accepted. In addition the complexity involved (i.e. the myriad of factors which affect the real economy) means that there is very little scope to 'validate' models against observed outcomes over time. For example, it is not possible to validate a land use model in the same way as a transport model. These models are built up from a large number of relationships which themselves have been derived via empirical or theoretical evidence.</p> <p>Instead this therefore comes back to the strength of the evidence used to support the key relationships being modelled. For example, the derivation of elasticities and the evidence produced to support these values is a key issue.</p> |     |           |   |
| Is the evidence used to support the key relationships that are included in the method   |   | Yes |           | Comment: Part of the evidence comes from WebTAG and the rest from analysis of London commuting flows, which is consistent with economic theory, although not the                  |



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| consistent with robust theory and empirical evidence, such as the evidence used for the derivation of elasticities?  |  |     | same as the definition of generalised costs used in the transport model. It is not clear whether these differences have any impact on the findings – given that crowding is the main difference between corridors and over time, it seems likely that the omission of journey time and fares has no significant effect on the relationship in the model.  |
| <p><b>Compatibility with Transport Model and with Transport Appraisal</b></p> <p>It is important that assumptions in the method used to estimate the local economic impacts are consistent with the main transport modelling and transport appraisal assumptions. A good method should be clear that there are no contradictions between the two sets of assumptions e.g. are these the same as have been used in estimating the relationship between transport costs and output (or employment) from which the employment or productivity elasticities have been derived? Are all mode costs combined or analysed separately?</p>   |  |     |   |
| Are the assumptions in the method for estimating local economic impacts consistent with the main transport appraisal assumptions? If not, are any deviations in the assumptions soundly justified?   |  |     | Partly/mostly<br>The economic impact model uses outputs from the transport model for estimates of changes in transport user costs in estimating agglomeration and labour supply effects. However, it would appear that, as is common with most/all of the approaches, the impact of increased labour supply on transport user costs is not re-estimated through a further round on model iteration. |
| <p><b>Metrics</b></p> <p>The different methods may present the outputs using different metrics. For example, some are presented in changes to GDP and / or GVA and / or employment. It may be that DfT or the decision makers for whom the analysis is being undertaken want the results to be presented using a particular metric, perhaps to allow comparison across projects. The output metrics used should be appropriate and meaningful in terms of meeting DfT requirements and informing policy decisions.</p>   |  |     |   |
| Are the metrics reported by the method useful and appropriate for informing the relevant decision makers?  |  | Yes | Comment: The results focus on the impacts on GVA, with the opportunity to identify benefits by zone.  |
| <p><b>Winners and Losers and Spatial Distribution</b></p> <p>This is a key criterion in the assessment, as many economic impact assessments focus solely on the immediate area of impact, without differentiating between newly generated economic activity and activity which has been redistributed from outside of the study area. To meet DfT requirements the results should show the economic impact at the national level as well as the local / regional / sub-national level.</p> <p>The introduction of new or improved transport links can clearly have more than one impact between the areas they are connecting. For example, both areas could see improvements, or at least net improvements as different sectors within each area are affected positively or negatively. Alternatively, one area could gain at the expense of the other. Indeed, it is</p> |  |     |   |

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|  | <p>possible that the area intended to benefit could see a negative impact on economic activity under certain circumstances e.g. inefficient industry and labour market being exposed to outside competition – the so called two-way road effect. While there are no hard and fast rules on which areas would benefit or lose in response to a transport intervention, it is important to assess how the model takes account of the impacts outside the study area and explain how factors such as economic activity, labour market performance etc are affected outside the study area (if at all). Again the evidence base underlying this will be important.</p> <p>Implicit in this is the importance that the spatial area is covered by the model e.g. local or regional and whether it accounts for impacts beyond the study area in any way. The approach should make clear how the redistribution of economic activity and of households is estimated and modelled.</p> <p>In addition, the method should explain how the displacement of the activities that move to the places benefitting from transport investment has been estimated and modelled. The method should also demonstrate to what extent displacement takes place <i>within</i> the study area and the impacts of this and whether the regions outside the study area from which economic activity is displaced identified.</p> <p>Finally, the models tend to deal with economic impacts (costs and benefits) that materialise over different time periods. The model needs to compare impacts of a particular intervention over different timescales, including the discounting which is applied to ensure like for like comparisons. A consistent approach is therefore required to ensure impacts associated with a particular scheme and its performance can be compared on a like-for-like basis.</p> |                    |  |
| Does the method take account of, and include estimates for, the impact of the transport proposal on other geographical areas outside the area that is under consideration? |  | Yes/to some extent | Comment: Corridors in which jobs that move from zones outside London to Central London are identified, although only in terms of where they cross the cordon set around London |
| Does the method have a robust approach to estimating additionality and displacement of economic activity?  |  | Yes                | Comment: Additionality should be largely addressed through the use of WebTAG agglomeration parameters. For displacement see above.   |
| Does the method apply an appropriate approach to discounting impacts that are generated in future years?   |  | Yes                | Comment: This is one of the few approaches which applied discounting in the analysis. As in the CBA - £bn PV discounted to 2005  |
| <b>Non-economic Impacts</b>  |  |                    |  |
| Does the economic or any other analysis identify other impacts such as the environment and non-work / social, which might have an impact on the                            | No   |                    | Comment: The approach is very much concerned with the economic impacts in terms of GVA.  |

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| location of households and employment?   |   |  |  |
| What account has been taken of the possible indirect effects on economic output, and is robust evidence provided and explained of these impacts? | Comment: None, other than the assumption based on work by Oxford Economic Forecasting about the propensity of London to attract jobs from overseas as a proportion of the jobs which shift from the rest of the UK to London through the move to more productive jobs, modelled as a relaxation of a commuting capacity constraint. |  |  |
| <b>Implementability</b>  |   |  |  |
| Does the method include clear and accurate guidance on its implementation and any limitations with its use that users should be aware of?        | No  |  | Comment: Used to demonstrate the GVA impacts of Crossrail. No other application described. |

| Local Economic Impact Method Assessment Summary Table  |   |                     |                                |               |   |         |       |
|--|---|---------------------|--------------------------------|---------------|---|---------|-------|
| Model / Method   | There are a number of different types of approaches / methods being used to estimate the economic impact of a transport scheme. This includes relatively simplistic survey-based approaches to much more sophisticated computable general equilibrium (CGE) models. Each of these can have general strengths and weaknesses and it is important to understand at the outset the basis of the approach and type of method that has been adopted. This prior consideration will give an early indication of the potential strengths and limitations associated with the type of approach. |                     |                                |               |   |         |       |
|  | Business and / or individual surveys  | Wage Equation Model | Computable General Equilibrium | Dynamic Model | Land Use and Transport Integration (LUTI) | Unclear | Other |
| What type of <b>approach / method</b> has been used? (please tick)   |   |                     | ✓                              |               |   |         |       |
| If other, comment: SCGE models have been developed to analyse the economic impact of transport interventions, but the only example of a SCGE model in the UK is SDG's SpECTra model. However, the SpECTra model is at an early stage of development. |   |                     |                                |               |   |         |       |
| <b>Criteria</b>  |   |                     |                                |               |   |         |       |

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| <p><b>Consistency with Robust Economic Theory</b></p>  | <p>It is clear that the various approaches currently being used to assess the sub-national, regional or local impacts of a transport intervention are based on different fundamental economic relationships linking transport investment and impacts on economic activity.</p> <p>A good method will provide strong grounds, in terms of the underlying economic theory and principles that form the framework for the method, to support the case that a transport intervention will lead to an increase in economic activity. It will, for example, demonstrate how the transport improvement is expected to feed through to higher levels of economic activity / GDP e.g. reduction in input costs, increases in output and / or employment? These relationships should be adequately explained in the documentation as should any further initiatives necessary to deliver the increase in economic activity.</p>  |            |   |
| <p>Is there a clear explanation of the economic theory and principles that form the framework for the method?</p>  |  | <p>Yes</p> | <p>Comment: The documentation provided to us by the SpECTra developers is very brief. However, the economic framework underlying the overall SCGE approach is set out clearly elsewhere (Gunn H 2004)</p>   |
| <p>Are the relationships via which the transport intervention is expected to feed through to a change in economic activity consistent with robust economic theories?</p> |  | <p>Yes</p> | <p>Comment: The approach might, in theory, be considered as the 'gold standard' against which any other approach might be judged. The theoretical underpinning of the models is based on conventional macro-economic theory and the empirical evidence upon which such models are built. However, from the literature and methods reviewed the models are still very much at the development stage.</p> |
| <p><b>Empirical evidence</b></p>   | <p>Evidence should be presented to support the impact of the transport improvement on the local economy. However, the literature to date suggests that the evidence to support the claimed direct linkages between transport investment and impacts on economic activity is not conclusive.</p> <p>A good method will therefore provide evidence to support the claimed impacts of the scheme and also indicate the robustness and/or uncertainties of the evidence.</p> <p>It should also explain why the evidence is relevant to the study / analysis e.g. the same mode, the same local labour market conditions apply, similar area characteristics and sectoral mix, similar scale etc.</p> <p>A particular source of uncertainty can be the direction of causality. Many factors – for example, transport connectivity and employment density – are closely correlated and it is difficult to separate the cause and effect. The method should therefore recognise where this is a difficulty and provide supporting evidence to distinguish between cause and effect in its assumed economic relationships.</p> |            |   |
| <p>Does the method provide a clear and appropriate description of the empirical</p>  | <p>No</p>  |            | <p>Comment: There is no documentation of the evidence underlying SpECTra. The model, as at present, is for demonstration purposes and to illustrate the potential of the approach.</p>  |

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| evidence that supports the claimed impacts, and also indicate the robustness of, and uncertainties associated with, the evidence?  |  |          |   |
| Does the method provide a robust justification of why the evidence is relevant for specific types of study / analysis, and also explain if there are limitations associated with its use?                      | No   |          | Comment: See above  |
| Does the method provide robust evidence for the claimed direction of causality between cause and effect of any claimed economic relationships e.g. the transport intervention and change in economic outcomes? | No   |          | Comment: No, but the sound theoretical basis should help to reduce the extent of any uncertainty about cause and effect. While outside the scope of this study, papers on the use of SCGE in other countries provide some discussion of the robustness of results and direction of causality.         |
| Are sensitivity tests provided that show the impact of changes in key assumptions and empirical estimates that are used?   | No   |          | Comment: In the main, no evidence of sensitivity tests been run under SCGE method. It would seem that such tests have been run using SpECTra but were not reported in the presentation supplied to us. Running sensitivity tests using SCGE models should not, in theory, be problematic if required. |
| <b>Sub-criteria - assessment of Land Use and Availability of Land</b>  | <p>Conventional transport models generally assume a fixed land use and that transport improvements accrue to existing businesses only by increasing productivity through, for example, reducing travel costs and through benefits from agglomeration. Local economic impact models however can be based on the assumption of flexible land use and business/workforce relocation (to allow a move to more productive jobs and an increase in total employment in the study area). It is important to understand these assumptions and their robustness as many of the benefits claimed are due to entrants into the local labour market leading to increased productivity and growth.</p> <p>The method should also be clear whether assumptions about changes in land use have implications for the estimates of demand derived from the transport model if this is based on a different land use assumption.</p> |          |   |
| Does the method provide robust explanation of why land use is assumed to be fixed, flexible, or flexible with constraints?   |  | Flexible | Comment: SpECTra allows for land use changes – it's not clear how these might be constrained. It can also model the effects of policies which change land use.  |
| Does the method provide robust theoretical and empirical evidence for the claimed relationship between the transport intervention and the impact on the location of businesses and                             | No   | Yes      | Comment: SCGE models are based on the theory that land use responds to changes in transport costs. But no evidence on the relevant elasticities or other evidence is provided in the brief description of SpECTra provided.   |

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| workers?   |  |      |  |
| If the method assumes flexible land use, are estimates of changes in land use taken into account in the estimates of transport demand?   |  | Yes  | Comment: This is a general equilibrium model and the interactions between transport and land use are iterated to an equilibrium.   |
| Are the assumptions about land use consistent with the relevant land use planning frameworks?  | Uncertain  |      | Comment: Not always clear from the literature which has been reviewed.   |
| <b>Sub-criteria - Labour Supply</b>  | <p>It is important that a method or model used can clearly explain the impact and assumptions on the supply of labour. Presenting a transparent account of the impacts on the labour supply will be crucial to the credibility of the method and results. For example, in estimating job / employment impacts, what assumptions are made about the supply of labour and how it contributes to higher levels of activity?</p> <p>The method should be clear whether the results are dependent on a supply of labour resource e.g. unemployed labour, and provide the evidence to demonstrate that this exists in the form assumed e.g. skilled or unskilled or whether an increase in the labour force are a result of relocation of workers from outside the study area and, if so, whether from other parts of the UK or abroad.</p> <p>The model should also be clear about, if there is claimed additional output per person, what causes the increased output? Evidence should be provided to support this effect and that it is a cause of the transport improvement. The method should explain whether the increase in output is from 'real' agglomeration effects as measured through wider impacts guidance i.e. within the existing sectoral mix, or is the increase in output generated by productivity impacts brought about by a change in the sectoral mix with low value jobs shifting out of the study area and higher value ones moving in.</p> <p>A good method should therefore be clear whether the method assumes relocation of labour and / or business under the do-something option and where the labour supply has come.</p> |      |  |
| Does the method provide a robust case, consistent with theory and empirical evidence, of how the transport intervention is assumed to affect labour supply in the study area and how this contributes to higher levels of economic activity? |  | Yes? | Comment: Brief description only provided for SpECTra. It would appear that labour supply within the travel to work area is fixed, but supply changes between the zones within the model in response to spatial policy interventions. |
| <b>Sub-criteria - Elasticities</b>   | <p>A number of the approaches for calculating local economic impacts, and the results generated, are dependent on robust estimates of labour supply elasticities and the response of the workforce to changes in wages. A number also include elasticities of productivity with respect to effective density.</p> <p>It should also be made clear whether the elasticities used are evidence-based or whether there are possible limitations e.g.</p>  |      |  |

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|   | <p>are the elasticities applicable to the occupations and/or geographic area that contribute to the increases in economic activity, and if not what are the implications?<br/> Information should be provided about the sensitivity of the estimated outcomes to uncertainties around the elasticity values and the extent of these uncertainties.</p>  |  |                               |
| If the method is dependent upon elasticities, does the method explain the evidence upon which the elasticities are based?   | No  |  | Comment: No evidence provided |
| Is the supporting evidence for these elasticities robustly based on empirical evidence and suitable for the specific use in which they are being applied?   | No  |  | Comment: See above            |
| Does the method clearly explain the uncertainties around the elasticity values, the extent of these uncertainties, and the impact that these uncertainties could have on estimates that are generated from the method of the economic activity impacts of a transport intervention? | No  |  | Comment: See above            |
| <b>Dependency on other factors</b>  | <p>It is important to understand whether the impacts predicted by the models are dependent on other factors occurring / complementing the transport investment. SACTRA concluded that additional, non-transport investment is generally required to deliver economic impacts. In addition, Eddington concluded that, in itself, transport investment may not create additional economic activity i.e. it is conditional on other factors, such as local market circumstances and labour market conditions. The method should therefore clearly explain whether the impacts on economic activity are dependent on the transport investment alone, or whether it is assumed to act as a catalyst for a number of other structural changes and market conditions in the local economy, e.g. flexible labour market, under-employment of land and capital, business capital, housing, business premises etc, and whether such assumptions are credibly supported by evidence.</p> <p>Also, it will be important that the non-transport factors that are needed to generate the impacts are made explicit, including their own benefits, costs and externalities. In addition, evidence should be provided to show that the non-transport impacts are likely to materialise. For example, by specifying any constraints on planning permission that might influence the level and location of development.</p> <p>If the method is dependent on other, non-transport factors materialising, the costs associated with these impacts should be included in the scheme assessment. In addition, these costs should include the impact of any local contribution to the scheme.</p> |  |                               |

| It should also be clear whether method takes account of opportunity costs.   |  |     |   |
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| Does the method explain whether the impacts estimated are dependent on other factors occurring / complementing the transport investment?   |  | Yes | Comment. It is a feature of a general equilibrium model that the other factors are included – indeed, a well-defined model will include all of the costs of a project and the effect of funding these costs through taxation.               |
| Are the non-transport factors that are needed to generate the impacts made explicit, including estimates of their own benefits and costs included externalities?   |  | Yes | Comment. Yes, apart from the externalities. And the user of the model might need to decide whether to allow, for example, land prices to rise in a zone served by a transport scheme or to allow for a policy of higher land use densities. |
| Is evidence provided that the non-transport factors are likely to materialise?   |  | Yes | Comment. Again a feature of the spatial and general equilibrium nature of the model   |
| <b>Counterfactual / Do-minimum</b>   |  |     |   |
| <p>Any economic impact assessment implicitly or explicitly involves the comparison of a Test Case with a Do Minimum or Reference Case. Understanding this counterfactual is crucial to the assertion of whether an intervention is likely to have the estimated effect, particularly if there are other proposals or schemes included in the Do Minimum which could influence the quantum of impacts of the proposal under consideration. It is important therefore that model users provide a clear explanation of a counterfactual so that there is transparency around the assumptions made with regard to the scenario where the proposed scheme is not introduced.</p> <p>It will also be important to understand whether the Do Minimum is comparable with the ‘do-minimum’ of the cost benefit analysis transport appraisal.</p> <p>A good method should therefore explain details of the counterfactual, particularly whether it is consistent with the do-minimum assumed in the CBA.</p> |  |     |   |
| Does the method provide a clear explanation of the counterfactual so that there is transparency around the assumptions made with regard to the scenario where the proposed scheme is not introduced?   |  | Yes | The approach is dependent on a base case against which the policy option is tested.   |
| <b>Data Use and Availability</b>   |  |     |   |
| <p>Many of the methods / models are highly dependent on specific data requirements, particularly at the local or regional level e.g. local levels of labour productivity by sector. However, in many cases this data is not readily available, and it will therefore be important to understand these requirements and limitations of the approach if the data is not available.</p> <p>The extent to which the data which is best suited to the analysis has been used should be made clear, as should the reliance placed on data which has been used but is less than ideal, for example because it covers a wider or different geographical area</p>   |  |     |   |



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|   | on the grounds that the ideal data is not available. It should also explain whether there any limitations or weaknesses with the data used e.g. has proxy data been used and, if so, whether it has possible limitations.   |     |  |
| Does the method explain why the data that is used is best suited to the analysis?   | No  |     | Comment: SpECTra is under development and there is no explanation of the data on which the experimental version is based.  |
| Does the method explain limitations or weaknesses associated with the data that is used, and identify how these could affect the analysis?                        | No  |     | Comment: the data requirements for an operational SCGE model are very substantial, both in terms of the exogenous inputs to the model and in terms of the coefficients in the model. Even if coefficients for firms' production functions and household utility functions can be obtained from other sources, estimating the equilibrium response to transport cost changes presents a significant challenge.  |
| Is the data required for application of the method freely and readily available for the study area under consideration?   | No  |     | Comment: Much of the data at the level of spatial disaggregation required is not available in The UK. In addition, substantial effort would be required to construct a database which could link these data to a transport model. Data on inter-regional trade flows are not available. It might be possible to synthesise these , although it is not clear whether this would be feasible at the level of spatial disaggregation of relevance to all but the very biggest transport schemes, since the vast majority of schemes cover no more than a single region. |
| <b>Uses and Limitations of the Method</b>   |   |     |  |
|   | It is important to understand the limitations associated with the use of a particular method e.g. are there theoretical or empirical limitations with specific applications of the approach the approach and are the assumptions of the method not suitable for use for specific applications.  |     |  |
| Are the key limitations associated with applying the method clearly explained?  |   | Yes | Comment: It remains unclear whether there is a feasible stage which is more firmly based on evidence of economic inputs and coefficients and which extends beyond the demonstration version of SpECTra.  |
| Are the assumptions associated with the approach clearly documented so that they are open to considering the suitability of the method for specific applications? | No  |     | Comment: No documentation provided of SCGE models.   |
| <b>Calibration and Validation</b>   |   |     |  |
|   | A potential key issue for determining the suitability and robustness of the methods will be the calibration and validation of the models used.<br>The terms 'calibration' and 'validation' are more generally associated with 'models' as opposed to 'approaches'. In a transport model context these terms are well understood in terms of (a) the models representing the present day observed situation, |     |  |

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|   | <p>and (b) the models responses to certain changes in inputs (e.g. a fuel price increase) being within accepted and established ranges.</p> <p>In this case though, the modelled relationships are not well understood or accepted. In addition the complexity involved (i.e. the myriad of factors which affect the real economy) means that there is very little scope to 'validate' models against observed outcomes over time. For example, it is not possible to validate a land use model in the same way as a transport model. These models are built up from a large number of relationships which themselves have been derived via empirical or theoretical evidence.</p> <p>Instead this therefore comes back to the strength of the evidence used to support the key relationships being modelled. For example, the derivation of elasticities and the evidence produced to support these values is a key issue.</p> |     |  |
| Is the evidence used to support the key relationships that are included in the method consistent with robust theory and empirical evidence, such as the evidence used for the derivation of elasticities? | No  |     | Comment: No documentation provided.  |
| <b>Compatibility with Transport Model and with Transport Appraisal</b>  | <p>It is important that assumptions in the method used to estimate the local economic impacts are consistent with the main transport modelling and transport appraisal assumptions. A good method should be clear that there are no contradictions between the two sets of assumptions e.g. are these the same as have been used in estimating the relationship between transport costs and output (or employment) from which the employment or productivity elasticities have been derived? Are all mode costs combined or analysed separately?</p>  |     |  |
| Are the assumptions in the method for estimating local economic impacts consistent with the main transport appraisal assumptions? If not, are any deviations in the assumptions soundly justified?        | Partially for SpECTra   |     | Probably, given the nature of the model, which covers the whole (regional) economy.  |
| <b>Metrics</b>  | <p>The different methods may present the outputs using different metrics. For example, some are presented in changes to GDP and / or GVA and / or employment. It may be that DfT or the decision makers for whom the analysis is being undertaken want the results to be presented using a particular metric, perhaps to allow comparison across projects.</p> <p>The output metrics used should be appropriate and meaningful in terms of meeting DfT requirements and informing policy decisions.</p>   |     |  |
| Are the metrics reported by the method useful and appropriate for informing the relevant  |   | Yes | Comment: SCGE models produce a range of economic outputs which will be of use. SpECTra, specifically, covers increases in output in percentage terms for the forecast year |

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| decision makers?   |   |     | (although not entirely clear – it might be in terms of a PV) and increase in GVA in the 2 zones and RoUK           |
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| <b>Winners and Losers and Spatial Distribution</b>   | <p>This is a key criterion in the assessment, as many economic impact assessments focus solely on the immediate area of impact, without differentiating between newly generated economic activity and activity which has been redistributed from outside of the study area. To meet DfT requirements the results should show the economic impact at the national level as well as the local / regional / sub-national level.</p> <p>The introduction of new or improved transport links can clearly have more than one impact between the areas they are connecting. For example, both areas could see improvements, or at least net improvements as different sectors within each area are affected positively or negatively. Alternatively, one area could gain at the expense of the other. Indeed, it is possible that the area intended to benefit could see a negative impact on economic activity under certain circumstances e.g. inefficient industry and labour market being exposed to outside competition – the so called two-way road effect.</p> <p>While there are no hard and fast rules on which areas would benefit or lose in response to a transport intervention, it is important to assess how the model takes account of the impacts outside the study area and explain how factors such as economic activity, labour market performance etc are affected outside the study area (if at all). Again the evidence base underlying this will be important.</p> <p>Implicit in this is the importance that the spatial area is covered by the model e.g. local or regional and whether it accounts for impacts beyond the study area in any way. The approach should make clear how the redistribution of economic activity and of households is estimated and modelled.</p> <p>In addition, the method should explain how the displacement of the activities that move to the places benefitting from transport investment has been estimated and modelled. The method should also demonstrate to what extent displacement takes place <i>within</i> the study area and the impacts of this and whether the regions outside the study area from which economic activity is displaced identified.</p> <p>Finally, the models tend to deal with economic impacts (costs and benefits) that materialise over different time periods. The model needs to compare impacts of a particular intervention over different timescales, including the discounting which is applied to ensure like for like comparisons. A consistent approach is therefore required to ensure impacts associated with a particular scheme and its performance can be compared on a like-for-like basis.</p> |     |  |
| Does the method take account of, and include estimates for, the impact of the transport proposal on other geographical areas outside the area that is under consideration? |   | Yes | Comment: Use of a SCGE model ensures that the impacts in the whole modelled area and outside it are accounted for. |
| Does the method have a robust approach to estimating additionality and displacement of   |   | Yes | Comment: See above   |

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| economic activity?   |  |           |   |
| Does the method apply an appropriate approach to discounting impacts that are generated in future years?   |  | Uncertain | Comment: Not clear.   |
| <b>Non-economic Impacts</b>  |  |           |   |
| Does the economic or any other analysis identify other impacts such as the environment and non-work / social, which might have an impact on the location of households and employment? | No   |           | Comment: SpECTra distinguished between households only according to the type of labour supplied (9 categories), income earned and zone of residence. SCGE models tend to be fairly simplistic in their categorisation of households to avoid further complexity.  |
| What account has been taken of the possible indirect effects on economic output, and is robust evidence provided and explained of these impacts?                                       | Comment: While taking account of quality of life impacts might be feasible in an advanced SCGE model, the complexity of the SCGE approach usually rules out such additions. As noted above, the application of SCGE models in England are very much at the development stage and have been for demonstration purposes. |           |   |
| <b>Implementability</b>  |  |           |   |
| Does the method include clear and accurate guidance on its implementation and any limitations with its use that users should be aware of?  | No   |           | Comment: The SCGE models are still very much under development and it is likely they will not be available for wider use in the short term.<br>Integrating the outputs of changes in transport costs derived from a transport model with the spatial representation of transport costs in the SCGE model has proved a challenge in those countries which are developing such models because the zones in the model of the economy are generally of the orders of magnitude larger than the zones in the transport model. SCGE models are better suited to testing broad policy options or perhaps packages of major projects rather than the typically relatively smaller urban or interurban schemes for which new guidance is required. As explained, the only example of a SCGE model for use in England is the SpECTra model, which is at present at a stage of development which demonstrates the relatively simple three-zone version of a SCGE model is operational. It is not clear whether the advances that have been made in some other countries in developing an SCGE model for the analysis of transport strategy could be repeated in the UK or whether constraints on the availability of data, such as information on inter-regional trade, would inhibit such progress. |

