Department for Transport

TAG Unit A2.1

Wider Economic Impacts Appraisal

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Department for Transport

Transport Analysis Guidance (TAG)

https://www.gov.uk/transport-analysis-guidance-tag

This TAG Unit is guidance for the **Appraisal Practitioner**

This TAG Unit is part of the family **A2 - Wider Economic Impacts**

Technical queries and comments on this TAG Unit should be referred to:

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1 Overview

1.1 Introduction

1.1.1 Within welfare analysis, economic impacts are primarily captured by the estimation of user benefits e.g. as a result of time savings. Under a well-defined set of circumstances user benefits will capture the entire welfare effects of a transport investment. However, if there are 'distortions' or market failures that mean the economy is not functioning efficiently, additional benefits (or disbenefits) will arise as the impact of transport improvements is transmitted into the wider economy. These are termed wider economic impacts and are the subject of the A2 series of units.

1.1.2 Research has shown that these wider economic impacts can be significant and can arise in a number of ways. These include productivity gains resulting from improvements in how well businesses are connected to each other as well as potential employees, and benefits arising from structural changes as businesses and households relocate.

1.1.3 This guidance sets out a framework for the investigation and assessment of these wider economic impacts. Underpinning this framework is a number of principles:

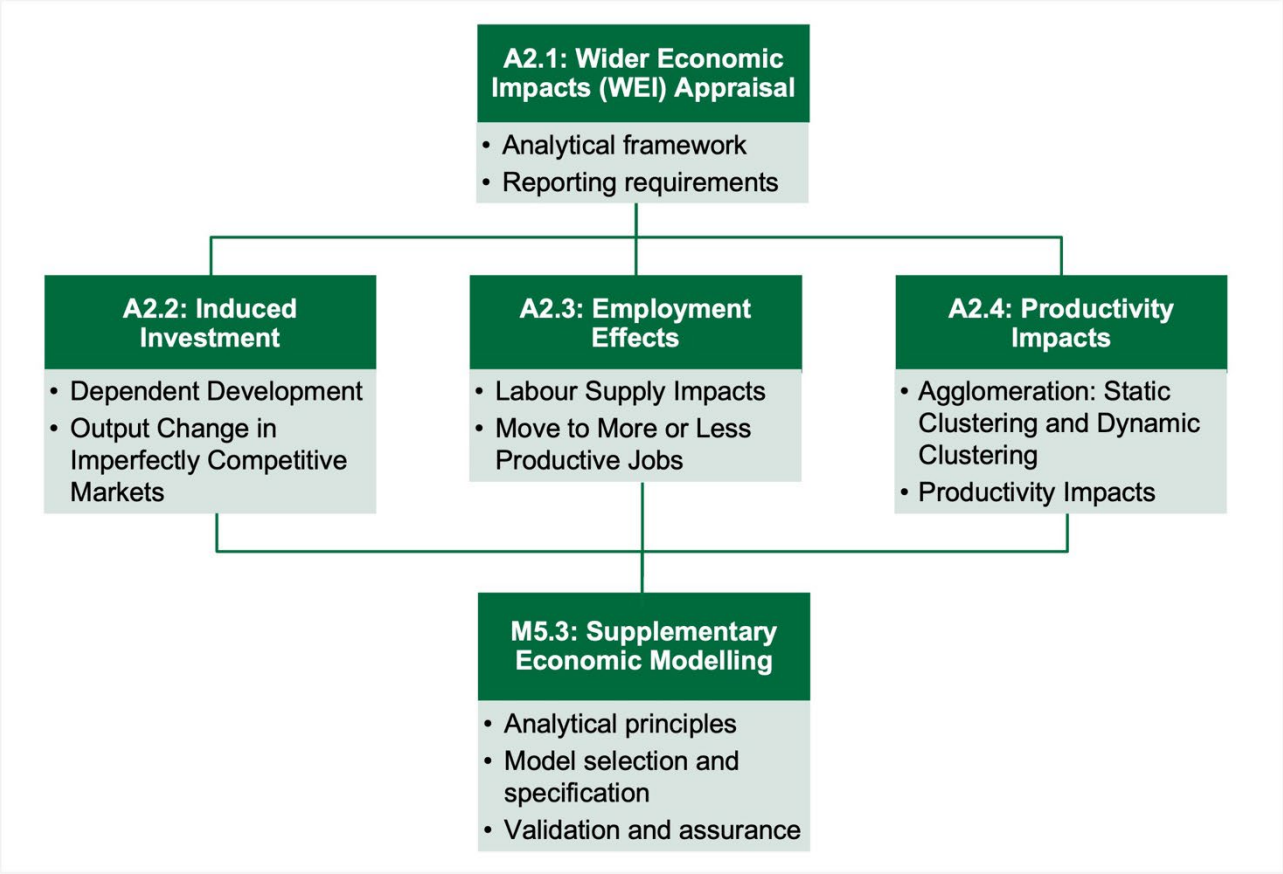
a) The economic impacts of transport investments are context specific; the type and magnitude of economic impacts which occur will depend upon the scheme type and more importantly the local attributes, such as workforce skills and the availability of land for development. Given the importance of context specificity, all assessments of economic impacts should be informed by a context specific Economic Narrative that will inform the analytical approach and Appraisal Specification Report. Modelling and valuing wider economic impacts is complex and subject to a high degree of uncertainty. This uncertainty increases when quantifying land use change. Clear, consistent and transparent reporting are required to ensure that the risks associated with wider economic impacts analysis are fully communicated. All analysis that underpins the assessment of impacts should be reported as a technical annex to the Economic Case in the form of an Economic Impacts Report or a report with equivalent content.

b) The Department's appraisal process is based on the principles of the HM Treasury Green Book guidance, which advocates the use of cost benefit (welfare) analysis to determine value for money. Welfare analysis is used as it captures a broad range of impacts, such as economic, environmental and social. Whilst gross domestic product (GDP) and gross value added (GVA) are useful economic indicators of economic performance they are not a substitute for welfare based measures used to inform the assessment of Value for Money.

c) Decision makers may have an economic objective to stimulate a local/regional economy, which may be more readily informed by non-welfare measures such as GDP rather than welfare analysis. Non-welfare estimates should be referenced in the Strategic Case next to the relevant economic objective. To ensure economic impacts are consistently communicated across the transport business case, welfare and non-welfare measures should be presented alongside each other in the Economic Case and differences explained presenting a clear bridge between these related measures of economic performance. Methods for deriving one from the other are provided in this guidance.

d) Land-use change arising from wider economic impacts can have feedback effects on the transport market which affect transport users, the environment and wider society. The guidance stresses the importance of capturing these feedback effects as a way of ensuring that the analysis is comprehensive.

Figure 1 Impacts considered in the A2 Units and M5.3



1.1.4 The guidance in the TAG A2 and related units sets out:

- how to develop the Economic Narrative and reporting requirements;
- the framework for quantifying and valuing both 'connectivity' and 'structural' wider impacts, with reference to the methodologies to capture the welfare associated with the most significant market failures (TAG unit A2.2 to A2.4); and

- the approach that should be taken when considering Supplementary Economic Modelling (SEM) to estimate wider economic impacts or other economic impacts not covered in these units (TAG Unit M5.3). This may include schemes which are driving significant regeneration, or have 'transformational' benefits.[1]

Figure 1 provides a high-level overview of the impacts considered in each unit;

1.1.5 Box 1 provides a summary of the key information required for the appraisal of wider economic impacts with links to the relevant parts of TAG for more detail.

[1] The HMT Green Book defines transformation as a *"practically irreversible change in a system that causes self-sustaining internal feedback effects that result in continuing change, or a new stable state, but not reversion to the original state."* There are competing definitions which are explored in DfT Commissioned research: Arup (2023), Understanding and Quantifying Transformational Impacts from Transport Interventions: literature review.

Box 1: Summary of Key Information for Appraisal of Wider Economic Impacts

What do we mean by wider economic impacts?

Wider economic impacts refers to economic impacts which are additional to transport user benefits. They arise because market failures in secondary markets (non-transport markets), such as the labour and land markets, mean that the full welfare impact of a transport investment may not be reflected in the transport market.

Why does the Department care about welfare-based appraisal?

The purpose of transport appraisal is to estimate the welfare impacts of transport investment to satisfy the accounting officer responsibilities that public expenditure represents value for money; this is in accordance with the requirements of the Treasury's Green Book.

When should this guidance be used?

This guidance should be used throughout the process of wider economic impact appraisal. It should be followed from the very start of the process, when deciding the scope of the analysis, to ensure a proportionate and consistent approach is adopted to the transport appraisal.

Under what circumstances should wider economic impacts be appraised?

Wider economic impacts can be appraised whenever there are considered to be significant market failures in secondary markets (non-transport markets), which are likely to have a significant bearing upon the welfare impacts of a transport intervention.

The assessment of wider economic impacts should only be undertaken under the following circumstances:

1. it is proportionate to do so – see 'Guidance for the Technical Project Manager' for further information on proportionate appraisals; and

2. the appraisal is accompanied by an Economic Narrative – see section 5 for guidance on developing an Economic Narrative.

Under what circumstances should the impact of transport schemes on GDP be appraised?

Gross Domestic Product (GDP) measures the value of marketable output during a given period of time. It is often used as a barometer of an area's economic health. It is not necessary for GDP to be reported in Business Cases, as the economic impacts of a transport intervention should already be captured in the welfare assessment.

GDP is not a substitute for welfare analysis and does not inform the value for money assessment. Because not all opportunity costs are reflected in GDP, it is only a partial measure of the full economic impact. GDP impacts should only be reported, if they are

relevant to specific economic objectives identified in the Strategic Case. Where local GDP figures are reported, the net impact on national GDP must also be reported.

How and when should economic impacts be quantified and valued?

On the basis of the impacts which have been identified in the Economic Narrative, the relevant methodologies within the wider economic impacts chapters should be applied. These, together with the assessment of user benefits, environmental and social impacts, form the central estimate of the transport appraisal. The technical units A2.2 to A2.4 provides methods to quantify impacts resulting from a scheme. Below is a summary of when such impacts are likely to be relevant to the scheme.

Induced investment (TAG Unit A2-2)

- Dependent development – most likely if the existing transport network cannot reasonably accommodate the additional traffic associated with a new development.

- Imperfectly competitive markets – most likely if businesses benefiting from the transport improvement have large shares of their markets.

Employment effects (TAG Unit A2-3)

- Labour supply impacts - transport is most likely to be a barrier to employment when an area has poor connections to employment centres and/or high transport costs relative to incomes.

- Move to Move Productive Jobs – most likely when accessibility is increased and jobs relocate to high productivity locations.

Productivity impacts (TAG Unit A2-4)

- Productivity impacts - most likely when a potential transport scheme falls within or is neighbouring a Functional Urban Region.

<u>Supplementary Economic Modelling (SEM)</u>

When structural economic impacts are expected to be a significant proportion of the overall impacts of a scheme, SEM may be undertaken either as part of early-stage options development or economic appraisal (see TAG Unit M5.3). For example, SEM could be used to:

- consider the spatial impacts of different options and inform strategic decisions on where to locate an investment or which scheme option to prefer;

- estimate the economic impacts associated with ‘transformational’ transport schemes, such as land use change;

- obtain context-specific estimates for wider economic impacts, for example context-specific agglomeration elasticities;

- estimate economic impacts not covered in the TAG A1 and A2 units, for example productivity impacts arising from localisation; or

- estimate sub-national economic impacts such as changes in local employment or GDP.

Under what circumstances will transport schemes expand the size of the national economy?

Transport investment can only expand the size of the national economy, if it has national supply-side effects. The most immediate supply-side effect of a transport investment occurs through its impact on transport capacity.

Transport investments may also induce supply-side effects on non-transport markets, such as the supply of labour. If there is no national supply-side effect, any local economic impacts related to these non-transport factors of production, such as higher levels of employment, will represent a displacement of activity from other locations. In other words, the default assumption is 100% displacement, which should be applied to all economic modelling.

The onus is on the scheme promoter to present credible evidence that the particular transport investment will affect a non-transport market. When estimating the complete extent of additionality, scheme promoters should consider a large enough geographical area to capture fully the behavioural responses of households and firms at the national level.

If the scheme promoter is unable to present credible evidence of additionality, the particular economic impacts will be considered displaced from elsewhere. See TAG Units 2.2 to 2.4 regarding evidence which could be provided to demonstrate a national supply-side impact.

How should the appraisal of economic impacts be reported?

The technical analysis, such as assumptions and modelling methods, should be reported in an Economic Impacts Reports, which accompanies the Business Case. The Economic Impacts Report is designed to improve transparency, so that analysis can be objectively scrutinised. For guidance on producing an Economic Impacts Report, see section 6.

The results of the welfare and non-welfare analysis should be reported in the Economic Case and reconciled; if non-welfare measures usefully inform the extent of which an economic objective has been met these should also be referenced in the Strategic Case. See section 7 for more information.

How should wider economic impacts inform a scheme's value for money assessment?

The Department for Transport recognises various types of analysis may be used to inform a value for money assessment.

The following wider economic impacts are included in the adjusted benefit cost ratio (BCR) metric:

- Labour supply impacts
- Static clustering
- Output change in imperfectly competitive markets

If certain criteria are met, indicative monetised impacts such as dynamic clustering, dependent development, and move to more productive jobs can be included as part of the indicative BCR metric. All other wider economic impacts should be reported as either indicative monetised impacts or non-monetised impacts within the value for money assessment. See value for money guidance[2] for more information.

How should Non-Economic impacts resulting from a scheme inform the value for money assessment?

Transport interventions and their associated economic impacts may have environmental, social and distributional impacts. Non-economic impacts are not within the scope of the Wider Economic Impacts guidance. Nevertheless, scheme-relevant impacts are important for the Value for Money assessment and should therefore be captured - See TAG units A3 and A4 for further details.

1.1.6 This TAG Unit describes the considerations and processes required in the assessment of wider economic impacts:

- Understanding the source of economic impacts and the interactions of secondary (non-transport) and transport markets (section 2);
- Quantification of economic impacts (section 3);
- Valuation of economic impacts and the sources of additional benefits (section 4);
- Defining the scope of the economic analysis (section 5);
- Documenting analysis in transparent manner (section 6); and
- Reporting welfare and non-welfare measures of economics impacts (section 7).

[2] https://www.gov.uk/government/publications/dft-value-for-money-framework

2. Understanding Economic Performance and Transport Investment

2.1 Introduction

2.1.1 This section outlines the transmission mechanisms through which transport improvements can impact the level and location of economic activity. The section is structured as follows:

- Section 2.2 explains the transmission mechanisms through which transport investments can impact the level and location of economic activity, and the importance of additionality;
- Section 2.3 summarises how economic impacts are captured in the Transport Business Case; and
- Section 2.4 outlines the role of GDP within the Transport Business Case

2.2 Transmission Mechanisms

2.2.1 This section outlines the mechanisms through which transport investment can impact the level and location of economic activity. These impacts will be context specific; the type and magnitude of economic impacts which occur will depend on the scheme type and more importantly the local attributes, such as workforce skills and developable plots. Given the importance of local attributes, complementary interventions, such as investment in skills and land zoning, may be required for the full potential of the transport investment to be realised. The rest of this sub-section presents the economic impacts of transport investment.

2.2.2 The direct effect of a transport investment is a change in accessibility, as measured by a change in generalised travel costs (GTCs), which can be observed in the transport market. Well targeted transport investments improve accessibility (reduced GTCs); in other words transport investments make travel between different locations easier.

2.2.3 The reduction in GTCs acts to raise productivity, as activities can be completed with fewer resources (time and financial).[3] Where the GTC reductions accrue to businesses this will directly impact economic performance (productivity increases).

2.2.4 GTC reductions are transmitted to secondary (non-transport) markets, as households and businesses change their behaviour in response to the new opportunities. The behavioural responses, such as induced investment and

[3] Note only changes in generalised travel costs as a result of a transport capacity improvement (supply-side effect) will increase productivity at the national level. When reductions in generalised travel costs are the result of transfers, such as taxes, subsidies or reduced profits, there will be no increase in productivity at the national level.

employment effects, will lead to changes in the level and location of economic activity – see Box 2 for summary of potential behavioural responses.

2.2.5 With the exception of static clustering, changes in secondary markets are associated with land use change (changes in the purpose or intensity of usage). For example, if a transport investment were to induce a housing developer to replace terraced housing with an apartment block (induced investment), this would be equivalent to an increase in the intensity of usage. Similarly, if a manufacturing business were to relocate from an urban to a rural area, it may involve a change in the purpose of land use, in the latter from agricultural to manufacturing.

2.2.6 Furthermore, for every scheme there will be a broad spectrum of responses, with the response of an individual transport user (household or business) dependent upon the specific context in which it operates. For example, a business operating in a market with elastic demand may find that it can profitably increase output, such that it either expands its operations on the existing plot (increased intensity of land use) or relocates to a new, bigger plot (change of land use purpose). Alternatively, a business, for which the delivery of output is not time critical may relocate, moving away from its customers to take advantage of lower rents in other areas with no change in the level of output or employment. The full spectrum of responses and impacts in secondary markets should be considered as part of the Economic Narrative.

2.2.7 Understanding these impacts in secondary markets is important – not least because any land use changes will change the demand for travel and hence accessibility. These feedback effects have the potential to change generalised travel costs and lead to further changes in behaviour and economic performance. An important role of the Economic Narrative is to understand the potential significance of these feedback effects and to consider how these can be represented in the modelling approach.

2.2.8 Box 2 summarises the economic impacts which could occur in response to a reduction in transport costs. Box 3 summarises the economy principles underlying TAG which underpin the appraisal of wider economic impacts.

Box 2: Summary of Economic Impacts

Generalised Travel Costs: accessibility changes as a result of transport investment.

Well targeted transport investments improve accessibility; in other words transport investment makes travel between different locations easier. Improvements in accessibility are measured by changes in generalised travel costs (GTCs). The reduction in GTCs will affect transport outputs, such as trip frequency, distribution, time period and mode choice.

Impacts in Secondary (non-transport) Markets

Induced Investment: changes in the productive capacity of the economy as a result of a transport investment. The change in attractiveness affects households' and firms' location decisions, it may also affect firms' opinions about the desired level of activity. Induced Investment changes land use, in terms of purpose or intensity of usage.

Employment Effects: changes in the level or location of employment. Changes in induced investment will affect firms demand for employment, in terms of the level and/or location, all else equal. The initial change in accessibility will also affect households' supply of labour, through the effect of the GTC reduction on the real wage. The employment effects are also associated with land use change, as land must be used more intensely or brought into production to accommodate the increased number of workers. It should be noted that if there is no change in the supply of labour at the national level, increased employment in one firm, locality or region will be at the expense of others; this is referred to as displacement. Nevertheless, even with displacement the relocation of employment may have productivity effects.

Agglomeration Economies: productivity is affected by the density of economic activity; this is a one of the reason for the existence of cities and specialised cluster, such as financial hubs (Venables et al. 2014). The productivity impacts may occur within or across industries, termed localisation and urbanisation economies respectively. Agglomeration economies are externalities and so are not reflected in transport markets.

Transport investments can increase the density of economic activity through two mechanisms:

i. Static clustering: The density of economic activity can be affected by changes in generalised travel costs which brings firms and employees effectively closer together. Reductions in generalised travel costs will increase productivity arising from static clustering and vice versa.

ii. Dynamic clustering: the physical density of economic activity can change as a result of changes to either the level or location of economic activity. Note that if there is a relocation of economic activity, the increased productivity in the area gaining jobs will be at the expense of those losing jobs but the total change in productivity need not sum to zero. Only an increase in jobs at the national level will have an unambiguous positive effect on productivity arising from dynamic clustering.

Box 3: Economy principles underlying TAG

Supply-side assumptions – currently TAG implicitly assumes that the economy is in 'full employment', with wages assumed to adjust to eliminate involuntary unemployment. This simplifying assumption is broadly consistent with guidance in the HMT Green Book[4] which implies that if there are no grounds for expecting a proposal to have a supply side effect, any increase in government expenditure would result in a matching decrease in private expenditure (known as 'crowding out').

The assumption of 'full employment' has a number of implications for transport appraisal:

- First, it implies that an increase in public- or private-sector spending on goods and services cannot raise total employment but instead displaces labour from elsewhere in the economy. As a consequence, TAG does not provide methods for appraising jobs and GDP associated multiplier effects or increased construction activity as these are assumed to have no net national impacts; and
- Second, it implies that the only means by which the government can raise total output is through supply-side measures such as boosting productivity or removing obstacles to people entering the labour market. Hence the A2 units provide the only methods to appraise supply-side impacts associated with transport investments (e.g. agglomeration benefits and labour supply effects).

Market failures and Government Distortions – TAG recognises that there are a number of market failures and government distortions in the market for goods, labour and land. For example:

- Externalities – TAG Unit A2.4 – Productivity Impacts, provides guidance for appraising the productivity benefits from increased clustering of businesses and households (known as 'agglomeration benefits'). Other Units also provide guidance for appraising welfare impacts associated with environmental and social externalities (e.g. impacts on air quality and accidents from increased car travel);
- Market structure – currently TAG allows for both perfect and imperfect competition in markets for goods and services. The method for estimating Transport User Benefits in TAG Unit A1.3 – User and Provider Impacts, implicitly assumes that businesses compete in perfectly competitive markets. Nevertheless TAG Unit A2.2 – Induced Investment, provides guidance to estimate Wider Economic Impacts associated with imperfect competition in markets for goods and services;
- Land rationing – It is recognised in TAG Unit A2.2 – Induced Investment, that planning policies may result in an inefficiently low level of construction activity. As a consequence the unit provides guidance to estimate the welfare benefits associated with enabled developments; and
- Tax distortions – even where there are no private welfare benefits from increased GDP (due to offsetting welfare losses) there may be welfare benefits from increased tax revenue. TAG Unit A2.3 - Employment Effects, provides guidance to estimate the tax wedges associated with labour supply effects and movement to more/less productive jobs.

International linkages – the methods in TAG are not intended to capture the impact of transport schemes on trade, foreign investment and net migration.

2.3 Capturing Economic Impacts in Transport Appraisal

2.3.1 The Department's appraisal process is based on the principles of the HM Treasury Green Book guidance, which advocates the use of cost benefit (welfare) analysis to determine the value for money of investment spend. In addition to economic impacts, welfare analysis captures a broad range of impacts such as environmental and social impacts. The latter, non-economic impacts are covered in the TAG A3 and A4 unites; they are not within the scope of this Wider Economic Impacts guidance.

2.3.2 Within welfare analysis economic impacts are primarily captured by the estimation of user benefits – see TAG Unit A1.3. Subject to the assumption that the economy is operating perfectly efficiently, user benefits will capture the entire welfare effects of a transport investment. Whilst improvements in transport may be transmitted into the wider economy (e.g. reduction in business costs being passed onto consumers as lower prices), such changes are simply transfers and net out on the national level (Venables et al 2014). Therefore, the methodology to value user benefits using the 'rule of a half' provides the best approximation when feedback effects into travel demand as a result of land use change are not significant.

2.3.3 The 'rule of a half' approximation fails, if there are (a) significant feedback effects into the transport market as a result of land use change or (b) 'distortions' or market failures which mean the economy is not functioning efficiently. In these situations, additional benefits (or disbenefits) may arise when the impact of transport improvements is transmitted into the wider economy.

Land Use Change

2.3.4 The 'rule of a half' methodology that is used to estimate user benefits is less accurate where land use change is significant. For the majority of schemes assuming 'fixed land use' transport user benefits will not materially impact upon the value for money assessment, as land use change and the resultant feedback effects to the transport market are unlikely to be significant in the overall context of the appraisal. There may be a small number of business cases which are predicated on land use change, for example where journey costs changes are large where the missing user benefits could be significant. It is not possible to determine a priori either the magnitude of the missing user benefits and user costs or whether these would increase or reduce the user benefits, estimated with fixed land use. The missing user benefits may be approximated by land value uplift in the case of dependent development or through Supplementary Economic Modelling (SEM) – see sections 3 and 4 for more details.

2.3.5 If significant land use change is forecast, this will also have effects for the appraisal of transport external costs and non-economic impacts. For this reason

[4] https://www.gov.uk/government/publications/the-green-book-appraisal-and-evaluation-in-central-government/the-green-book-2020

care should be taken to ensure these impacts are appraised consistent with the Do-something and Do-minimum land use – see A2.2 Induced Investment for guidance on transport external costs under land use change, Environmental Impacts (A3), and Social and Distributional Impacts (A4).

Distortions/Market Failures

2.3.6 Market failures and distortions, which cause markets to function inefficiently, are observed through the divergence of private costs and benefits experienced by individuals or businesses and the costs and benefits to society at large. User benefits capture the private costs and benefits, while wider economic impacts capture changes in the divergence. The focus of the units A2.2 to A2.4 is the identification, quantification and valuation of those additional benefits that arise due to the most significant market failures and distortions. These additional benefits are termed Wider Economic Impacts (WEIs) because they refer to changes in non-transport markets.

2.3.7 Where other market failures, such as coordination failure (Venables et al. 2014), WEIs not captured in the TAG A2 units or contextual specificities of the scheme may be relevant, schemes may be appraised using Supplementary Economic Modelling following the principles described in TAG Unit M5.3.

2.3.8 A summary of potential market failures and distortions is presented in Table 1. Note the fourth column references TAG units which provide methods for estimating the extent to which a transport intervention impacts these market failures, and market failures where no method currently exists in TAG.

Table 1 - Market failures and distortions

Market failures and distortions	Explanation	Potential context-specific evidence to identify market failures and distortions	Method to capture?
Product markets			
Imperfect competition	Where markets are dominated by a small number of businesses, there is a risk that supply is restricted in order to raise prices above marginal production costs. This may result in an inefficiently low levels of production and investment in this sector.	• Small number of businesses in a given sector. • Evidence for 'barriers to entry' of a given market. • Evidence that businesses in this sector have 'market power' (i.e. can set prices above marginal production costs).	A2.2
Tax distortions	Firms make investment decisions on the basis of private costs and benefits. Nevertheless, the	• Evidence that tax distortions are influencing businesses' investment decisions.	No TAG method

Market failures and distortions	Explanation	Potential context-specific evidence to identify market failures and distortions	Method to capture?
	requirement to pay tax on profits may distort businesses incentives, potentially resulting in an inefficiently low levels of production and investment.		
Positive externalities from product variety	There may be positive externalities to consumers and businesses as a result of an increase in the variety of goods and services available.	• Evidence that proposed investments will significantly increase the variety of goods and services available.	No TAG method
Land markets			
Land rationing	Planning policies may be inefficiently restrictive, resulting in an inefficiently low level of investment in new developments.	• Significant differential between the price of developed and un-developed land in the local area.	A2.2
Imperfect competition	If land is owned by a small number of individuals or institutions there is a risk that supply is restricted in order to raise the value of developed land. This may result in an inefficiently low level of investment in new developments.	• Land held by a small number of land-owners. • Large areas of under-utilised land in city centres (e.g. warehouses, poor quality developments etc).	No TAG method
Co-ordination failure	Developers may under-invest in local transport improvements due to co-ordination failure, resulting in an inefficiently low level of investment in new developments.	• Evidence that there are a number of developers who might benefit from local transport improvements.	No TAG method
Labour markets			
Frictional unemployment	Individuals do not instantaneously find jobs upon entering the labour market or leaving previous employers, such that there is a time search element to unemployment.	• Evidence from Department for Work and Pensions' data that durations on benefits are higher than the national average.	No TAG method
Wage rigidities	Markets are often characterised by sticky prices, in which the market price does not equate	• Evidence of strong trades unions and professional bodies.	No TAG method

Market failures and distortions	Explanation	Potential context-specific evidence to identify market failures and distortions	Method to capture?
	supply and demand in the short term, such that there is excess demand or supply for labour. In the case of excess supply of labour, this is referred to as structural unemployment.	• Evidence of national minimum wage rates diverging from the local labour market. • Evidence of unemployment being concentrated within a particular skill set.	
Tax distortions	Individuals and businesses make decisions about how much labour to supply and demand on the basis of the private gain (wages and profits). The imposition of taxation may distort the incentives of individuals to supply and businesses to demand labour, thereby affecting the competitive labour market equilibrium.	• Evidence that wages received by employees differ from the cost incurred by the employer as a result of labour taxes.	A2.3
Monopsony buyers	If the local labour market is dominated by a single employer, the dominant position may be exploited to artificially hold the wage rate below the market clearing price, such that employment is below the competitive market outcome.	• Extent to which the market is dominated by a single employer.	No TAG method
Agglomeration			
Externality from density of economic activity	Individuals and firms derive productivity benefits from locating in close proximity to other individuals and firms. These arise from improved labour market interactions, knowledge spill-overs and linkages between intermediate and final goods suppliers - these can occur within an industry (localisation economies) and/or across industries (urbanisation economies).	• Large-scale developments located within or close to a Functional Urban Region (defined in TAG Unit A2.4 – Productivity Impacts).	A2.4

2.4 The role of non-welfare metrics in transport appraisal

2.4.1 Business Cases often include economic objectives that extend beyond the value for money conclusions such as increasing employment or regenerating a local area. The extent to which these objectives are achieved may be better informed by non-welfare measures such as GDP rather than welfare estimates. Where economic objectives are set out in the Strategic Case, non-welfare measures reported in the Economic Case may also be referenced – see section 7.4 on reporting non-welfare measures.

2.4.2 Gross Domestic Product (GDP) measures the value of marketable output during a given period of time and is often used as a barometer of an area's economic health. It is not necessary for GDP, a non-welfare measure, to be reported within the Transport Business Case, as the economic impacts of a transport investment should already be captured in the welfare analysis. However, in specific circumstances non-welfare analysis may be presented in the Economic Case and referenced in the Strategic Case to inform the extent to which specific economic objectives are met.

2.4.3 Figure 2 is a stylised representation of the welfare and GDP effects associated with the impacts of transport investment; impacts are grouped according to whether they affect welfare, GDP or both. The latter includes only those impacts, for which the welfare and GDP changes are unambiguously equivalent and includes business user benefits and all wider economic impacts.

2.4.4 Business user benefits are a welfare impact which also affect GDP through improving productivity in the economy. However the relationship between GDP and welfare from other impacts is more complex. For example a commuter travel time reduction, which induces someone into the labour market. The impact of that additional job on GDP is the value of the output of that job. However the benefit to the individual (welfare) is smaller. They have gained the wage from their job, but they now have to spend time and money commuting, they have lost leisure time.

2.4.5 Indeed the benefit to the individual can be no greater than the value of the commuter travel time reduction – otherwise they would not have needed the time saving brought about by the transport improvement to enter the labour market. This is why commuter user benefits capture the welfare effects, and GDP impacts are not necessarily additional.

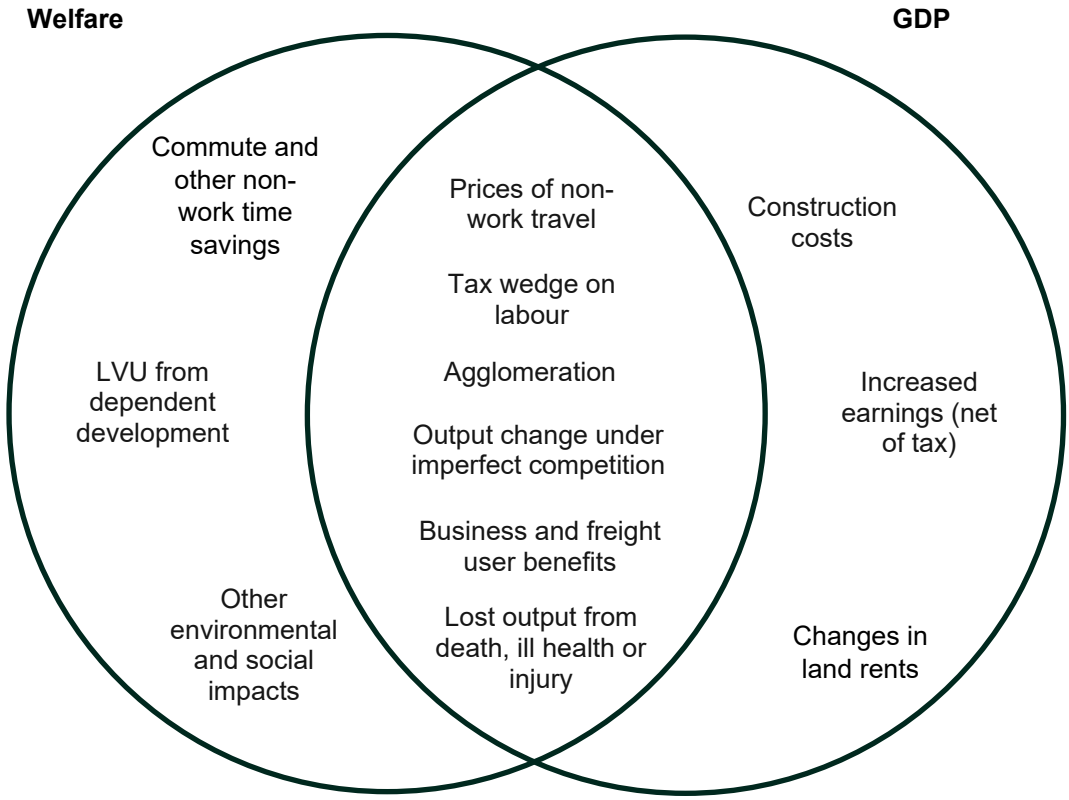
2.4.6 At the same time it is not always true that commuter travel time reductions will result in an increase in GDP. The commuter may choose to enter the labour market, or work more (which will have an impact on GDP), but they could equally choose to use devote the time savings to more leisure time (which has an impact on welfare, but not on GDP). For this reason commuter and leisure user benefits are not considered equivalent to GDP.

2.4.7 The only impacts which are additional to user benefits in both welfare and GDP are the result of distortions and market failures in secondary markets – wider economic impacts. In the example of a commuter entering the labour market,

there is a distortion introduced by taxation; introducing a 'wedge' between the private benefit to the individual worker (i.e. their take home pay) and the value of what they produce to society (i.e. the value of goods and services they produce).

2.4.8 The value of the commuter user benefits reflects the private benefit of that person entering the labour market. However the increase in what is produced (GDP) and its value to society (welfare) is greater than the private benefit by the value of the tax distortion.

Figure 2 **The Links between Welfare and Gross Domestic Product**



2.4.9 The discussion above raises a number of important implications:

- Increases in economic activity do not necessarily demonstrate that "user benefits" fail to capture all benefits, rather that measures of GDP may fail to capture all of the opportunity costs.
- Wider economic impacts arise from market failures and distortions in secondary (non-transport) markets. It is only by identifying and understanding these market failures and distortions that robust estimates of these additional benefits can be estimated.

- Forecasts of GDP increases will include estimates of user benefits which have been subsequently transmitted into the economy.

2.4.10 Within the Business Case, it should be clear to the reader that GDP and welfare are not additive, which this guidance reflects. Impacts on welfare (over and above user benefits) will only occur where distortions or market failures lead to differences between the private costs and benefits and social costs and benefits.

3. Quantifying Economic Impacts

3.1 Introduction

3.1.1 This section summarises some of the key considerations when quantifying the economic impacts of transport investment. The choice of approach should be based on the Economic Narrative, which sets out the mechanisms through which the scheme might impact on the economy. A key decision in selecting the appropriate approach is whether significant land use changes are anticipated or further context-specific evidence is required to determine the prevalence and scale of market failures and distortions. When Supplementary Economic Modelling (SEM) is undertaken, key uncertainties and assumptions about complementary investments must be understood and fully described.

3.1.2 The rest of this section is structured as follows:

- Section 3.2 introduces the different levels of analysis;
- Section 3.3 outlines the different scenarios which informs the transport model runs required to estimate wider economic impacts;
- Section 3.4 summarises the circumstances in which supplementary economic models may be applied in appraisal;
- Section 3.5 provides overarching principles which should be followed in cases of complementary interventions; and
- Section 3.6 outlines the importance of choosing an appropriately sized study area to minimise displacement.

3.2 Levels of Analysis

3.2.1 Transport investments can have a variety of impacts, not all of which are economic. In addition to user benefits and wider economic impacts, transport investments may be associated with Transport External Costs, Environmental, and Social and Distributional Impacts – these are defined in A2.2, A3 and A4 respectively.

3.2.2 The valuation of all these impacts requires the outputs from transport model runs: model runs of different scenarios will be needed when exploring the

impact of land use change – see section 3.3. The impacts and scenarios from which they are derived are included in different levels of analysis.

3.2.3 There are three levels of analysis (outlined below), which are differentiated on the basis of the maturity of the analytical techniques:

- Level 1 includes impacts which assume fixed land use excluding wider economic impacts.
- Level 2 includes wider economic impacts which assume fixed land use (connectivity impacts) or do not require land use change to be explicitly quantified.
- Level 3 includes analysis in which either land use change is explicitly quantified (structural impacts) or supplementary economic modelling has been conducted.

3.2.4 The levels are sequential and all Transport Business Cases should start with Level 1 and build upon this; the level of analysis conducted will depend on the economic impacts and market failures identified in the Economic Narrative. The use of levels has a number of benefits:

- **Proportionality**: Some impacts rely on increasingly complex analysis, in particular level 3 analysis where assessments of these impacts may be neither proportionate nor relevant. The complexity, time and financial cost of undertaking such analysis should be balanced against the potential effect on the value for money conclusion and the relevance of the impacts to the scheme's objectives. In the case of supplementary economic modelling, judgements on proportionality will differ depending on whether a model already exists. Table 2 summarises the proportionate levels of analysis at which to capture impacts.
- **Expected significance of WEIs**: The greater the proportion of total impacts made up by structural impacts, the more relevant level 3 analysis becomes. We would not expect small local schemes to undertake level 3 analysis as structural impacts are likely to be a relatively small proportion of the scheme's total impacts and hence are unlikely to change the value for money category. For this reason, small schemes which only undertake levels 1 and 2 analysis will not be disadvantaged when making the case for investment. In certain circumstances, level 3 analysis may be justified for small schemes, such as in the case of dependent development. The scope of the analysis should be justified in the Economic Narrative.
- **Maturity of methodologies**: The levels of analysis reflects the approach taken in the value for money assessment, in which impacts are differentiated on the basis of analytical maturity and the level of uncertainty around the scale of the impacts.

In deciding the required level of analysis, one needs to identify the individual impacts.

3.2.5 Within each level and for any given scenario consistent assumptions about land use change should be applied to the analysis of all relevant impacts (i.e. identified and justified in the Economic Narrative) with the potential exception of Level 3. In levels 1 and 2, land use is fixed and consistent between the 'do-

minimum' and 'do-something' forecasts, whilst in the case of level 3, land use may vary between the 'do-minimum' and 'do-something' forecasts.

3.2.6 The requirement for consistent assumptions of land use change has the following implications:

- Only those impacts, including non-economic impacts, which can be estimated with the fixed land use assumption should be included in Levels 1 and 2; and
- In Level 3 analysis, for any given scenario all impacts must be estimated using a single land use change forecast. With the exception of user benefits, all Level 1 and 2 impacts should be re-estimated using the transport model outputs from a model run which has both the do-something transport schemes and details of land use change (see Section 3.3 for more detail).
- In Level 3 analysis, user benefits should be estimated with the fixed land use assumptions from Level 1 analysis; as mentioned in section 2 this will proxy for user benefits with variable land use.

3.2.7 The wider economic impacts, captured in TAG Units A2, can be divided into three distinct groups on the basis of land use change – summarised in Table 2. This determines within which level of analysis they are included and how these impacts are reported within the VfM assessment:

- Static clustering, labour supply impacts and output change in imperfectly competitive markets are included in level 2 analysis.
- Dynamic clustering, move to more/less productive jobs and dependent developments are included in level 3 analysis.
- Labour supply impacts and output change in imperfectly competitive markets can also be estimated with variable land use assumptions and if this done they should also be included in level 3 analysis.

Table 2 - Relationships between Wider Economic Impacts, Levels of Analysis and Land Use assumptions

	Level 1 (Initial BCR)	Level 2 (Adjusted BCR)	Level 3 (Indicative BCR**, or other indicative monetised Impacts or non-monetised Impacts)
Fixed Land Use	User benefits →	→	→
Implicit Land Use Change		Static Clustering →	→
		Output Change in Imperfectly Competitive Markets →	→
		Labour Supply Impacts →	→
Explicit Land Use Change			Dependent Development
			Move to More/Less Productive Jobs
			Dynamic Clustering

**Note that the arrows signify the previous levels of analysis are required. **Indicative monetised impacts can be included in the indicative BCR subject to certain criteria being met, see DfT's value for money guidance for more information.*

3.3 Transport Models

3.3.1 Transport models should inform the core scenarios of all appraisals – for information on model development see Guidance for the Modelling Practitioner. They are required to estimate measures of accessibility (generalised travel costs), which are inputs to the assessment of user benefits, wider economic impacts, transport external costs (relevant in cases of variable land use) and supplementary economic models.

3.3.2 If significant land use change is forecast, the impact of this on trip distribution and generation **must** be captured in the transport model and the subsequent transport appraisal. This is to ensure the transport flows reflect the behavioural response, in order that the transport externalities, such as congestion, local air pollution and carbon emissions, are measured on a consistent basis with the economic impacts. Note user benefits will continue to be estimated assuming fixed land use, as the current methodology is inappropriate in cases of significant changes in land use. See section 4 for more detail on the valuation of impacts.

3.3.3 There are four 'model-runs' referenced for the estimation of the impacts of transport investment – Table 3. The relevance of these scenarios to any given transport appraisal is dependent upon the expected impact of the transport

investment on land use, as identified in the Economic Narrative. The 'model-runs' relevant to each level of analysis are as follows:

- Level 1 assumes fixed land use and requires model runs of A and D.
- Level 2 applies the fixed land use assumption in the transport model and requires model runs of A and D.
- Level 3 assumes variable land use and requires model runs of scenarios A and C. In addition, user benefits should continue to be estimated on the basis of fixed land use and will require model runs of A and D.

3.3.4 In the case of Dependent Development model run 'B' is required for the dependency test and is subsequently revised, 'A', to account for non-dependent traffic – see TAG Unit A2.2 for guidance on undertaking dependency tests and developing the *'do minimum'* scenario A'.

Table 3 – Combinations of Model Runs – with/without land use change and the transport scheme

	Without Land Use Change (Fixed Land Use)	**With Land Use Change (Variable Land Use)**
Without transport scheme	A	B
With transport scheme	D	C

3.4 Supplementary Economic Modelling (SEM)

3.4.1 Where considerations of land use change are required, SEM may be utilised in analysis. SEM refers to a broad group of basic and advanced modelling approaches, such as Additionality models, Land Use-Transport Interaction (LUTI) or Spatial Computable General Equilibrium (SCGE) models, the results of which could inform the value for money (VfM) assessment. The weight attached to analysis derived from SEM in the VfM assessment will depend upon the quality and uncertainty of the analysis as set out in TAG Unit M5.3. SEM based analysis must be transparently reported according to the guidance in section 7.

3.4.2 SEM may be used early in the appraisal process to consider spatial impacts and inform high level strategic decisions around where to locate an investment and identify a preferred scheme. The details of scheme design and delivery may then be appraised on the basis of relevant and proportionate analysis. SEM is most likely to be useful when a scheme is expected to have significant WEIs.

3.4.3 When conducted as part of full economic appraisal, SEM may be used to obtain estimates of welfare effects of the transport investment, in particular to:

- quantify and value user benefits under significant land use change;
- obtain or apply more context-specific estimates of welfare impacts than provided by the methodologies in the TAG A2 units, such as mode-specific agglomeration elasticities;

- capture a broader range of economic impacts than those covered in the TAG A2 units, such as localisation economies; and
- estimate sub-national impacts, such as changes in local employment and GDP.

3.4.4 The choice of which type of SEM to apply in appraisal will depend upon several characteristics of the scheme, the particular economic impact and technical aspects of the modelling. Section 5 of TAG unit M5.3 provides high-level guidance on how to select a suitable SEM approach.

3.4.5 It is essential that the modelling choice is justified in the Economic Narrative and reported in the Appraisal Specification Report (see Guidance for Technical Project Manager). The design of the transport model and SEM will need to be considered jointly to ensure any interface issues are appropriately managed.

3.5 Complementary Interventions

3.5.1 As outlined in section 2.2, transport investment directly affects accessibility, which may induce changes in secondary (non-transport) markets. Nevertheless, transport is only one factor which influences individuals' and businesses' decisions and complementary investments, such as the granting of planning permission by local authorities or policies to develop the skills of the local workforce, may be required to fully realise any induced changes. A consideration of complementary interventions may be particularly important for regeneration and transformational schemes. However, if the complementary investment exists in the do-minimum (as defined in TAG unit M4) then standard appraisal guidance should be followed.

3.5.2 Where complementary investments are identified as relevant to the appraisal, these should be set out in the Economic Narrative along with details on their current planning and funding status.

The core scenario

3.5.3 The core scenario should be constructed in line with the guidance in TAG Unit M4 'Forecasting and Uncertainty' and should assume that the transport investment occurs without any complementary investments.

Where complementary investment is not dependent on the scheme

3.5.4 Alternative scenarios should be constructed to understand the potential implications of complementary investments on the impacts of a scheme – these complementary investments should be added to both the do minimum and do something cases. In determining the weight to attach to these alternative scenarios the analyst should provide an assessment of the likelihood of the complementary investments arising. In line with the principles outlined in unit M4, this assessment should be supported by evidence on the planning and funding status of these interventions.

3.5.5 Analysis of alternative scenarios can be used to determine the sensitivity of the value for money case to complementary investments by considering how likely these investments would need to be for their inclusion to change the value for money assessment. One method to test this – outlined in footnote [5] – is to calculate the expected value of a scheme under different assumptions about the likelihood of these complementary investments being implemented. This information should be used alongside evidence on the likelihood of complementary investments occurring to inform the value for money judgement.

Where complementary investment is dependent on the scheme

3.5.6 Where complementary investment is dependent on the transport investment, TAG Unit A2.2 should be used to appraise the impacts of dependent development associated with a transport scheme.

Where expenditure decisions are linked together

3.5.7 Where a number of expenditure decisions are linked together and the costs or benefits are mutually dependent, the overall proposal should be appraised as a package, in line with HMT Green Book guidance. For the purposes of a business case seeking DfT approval, only the costs to the broad transport budget should be put in the PVC, with other costs represented as a dis-benefit in the PVB.

3.5.8 For further information on scenario testing see Forecasting and Uncertainty M4.

3.6 Size of Geographical Study Area and Displacement

3.6.1 Key to any assessment of wider economic impacts is displacement. As mentioned in section 2, transport investment may induce a relocation (displacement) of economic activity such that an economic impact in one local area is at the expense of another; in other words a local impact may not be equivalent to the national impact. Deriving the national (United Kingdom) impact is important because this is the geographical level at which the value for money assessment is conducted.

3.6.2 Transport investment can only expand the size of the national economy if they have national supply-side effects. The most immediate supply-side effect of a transport investment is through its impact on transport capacity.

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5 The expected net present value from the transport investment can be calculated using the formula in the table below, by multiplying each outcome by its associated probability. NPV(scheme | complement) is the NPV of the scheme from an appraisal where the complement is in both the without and with-scheme cases, whereas NPV(scheme | no complement) is the NPV of the scheme from an appraisal where there is no complement. The former should capture the positive interaction between the transport investment and other complementary investment. The expected BCR can be calculated in an analogous way.

NPV of scheme	0.3 x NPV(scheme | complement) + 0.7 x NPV(scheme | no complement)
BCR of scheme	$\frac{0.3 \times PVB(\text{scheme} \mid \text{complement}) + 0.7 \times PVB(\text{scheme} \mid \text{no complement})}{0.3 \times PVC(\text{scheme} \mid \text{complement}) + 0.7 \times PVC(\text{scheme} \mid \text{no complement})}$

3.6.3 Transport investments may also induce supply-side effects of the other factors of production, such as the supply of labour. If there is no national supply-side effect, any local economic impacts related to these non-transport factors of production, such as higher levels of employment, will represent a displacement of activity from other locations.

3.6.4 With respect to supply-side effects of non-transport factors of production, the default assumption is 100% displacement; this applies for all types of economic modelling. The onus is on the scheme promoter to present credible evidence that the particular transport investment will affect a non-transport factor of production. If the scheme promoter is unable to present credible evidence of additionality, the particular economic impacts will be considered displaced from elsewhere. Within TAG Units 2.2 to 2.4, guidance is provided on evidence which could be provided to demonstrate a national supply-side impact.

3.6.5 In order to estimate the complete extent of additionality, scheme promoters should consider a large enough geographical area to capture fully the behavioural responses of households and firms at the national level– for further information see M2 – Variable Demanding Modelling.

4. Valuing Wider Economic Impacts

4.1 Introduction

4.1.1 This section describes how economic impacts can be captured in accordance with the HMT Green Book guidance and principles of welfare analysis. It also provides guidance on how estimating economic outcomes, such as GDP or employment may supplement the welfare analysis in the Business Case.

4.1.2 In this section we only consider how economic impacts are captured, for guidance on capturing non-economic impacts see A3 – Environmental Impacts and A4 – Social and Distributional Impacts. This section is structured as follows:

- Section 4.2 outlines the approach to value economic impacts in welfare analysis;
- Section 4.3 outlines how the user benefits associated with land use change may be approximated through Supplementary Economic Modelling or by land value in the case of dependent development;
- Section 4.4 outlines which of wider economic impacts captured in TAG and which are additional to one another; and
- Section 4.5 outlines the circumstances in which GDP analysis can be used to supplement welfare analysis.

4.2 Welfare Analysis

4.2.1 As mentioned in section 3, analysis of wider economic impacts should be presented at levels of increasing complexity. This section sets out where the different wider economic impacts should be reported within the levels of analysis; wider economic impacts are only included in level 2 and 3 analysis due to the maturity of the analytical techniques.

4.2.2 The greater the proportion of total impacts made up by structural impacts, the more relevant level 3 analysis becomes. We would not expect small local schemes to undertake level 3 analysis given that structural impacts are likely to be a relatively small proportion of the scheme's total impacts. As a result, the likelihood of a change in the value for money category is low. For this reason, small schemes undertaking lower levels of analysis will not be disadvantaged. There may be cases where the Department would consider it justifiable to undertake level 3 analysis, for example, in the case of dependent developments.

4.2.3 For the most part the wider economic impacts within TAG Units A2.2 – A2.4 are additional; the result from estimating one wider economic impact can be added to that of another without the risk of **double-counting**. However, there are two key exceptions – these are reflected in the Level 3 methodology outlined below:

- Dynamic clustering is not additional to static clustering, as the latter is implicitly captured in the former – see TAG Unit A2.4.
- Land value uplift, the methodology to value dependent developments, is not additional to other wider economic impacts occurring within that development, as there could be potential double-counting – see section 4.3.

Level 1: Assessment of impacts with fixed land use

4.2.4 The starting point for all transport appraisal is the estimation of user benefits with fixed land use; this forms the basis upon which all subsequent analysis builds.

4.2.5 Note: only those Environmental Impacts, and Social and Distributional Impacts, which are included in the initial BCR, should be included in level-1 analysis – see TAG Unit A1.1 for information on the reporting of Environmental, and Social and Distributional Impacts within the value for money assessment.

Level 2: Assessment of wider economic impacts with fixed land use (connectivity impacts)

4.2.6 For some schemes, scheme promoters may wish to build on the level 1 analysis to include WEIs and *other* impacts, which can be estimated without the quantification of land use change. In the case of wider economic impacts these should use the standard assumptions set out in TAG Units A2.2 – A2.4 for static clustering, labour supply impacts and output change in imperfectly competitive markets, with decision of which to include justified in the Economic Narrative.

Level 3: Assessment of impacts utilising context specific parameters or variable land use (structural impacts)

4.2.7 The purpose of Level 3 analysis is to estimate certain wider economic impacts under land use change. These include the Moves to More/Less Productive Jobs, Dynamic Clustering and Induced Investment. The TAG Units A2.2 to A2.4 provide standard methodologies to estimate these impacts, though in certain circumstances it is recognised that more sophisticated supplementary economic modelling may be required.

4.2.8 In the case of explicit quantification of land use change, all impacts except for user benefits should be re-estimated to test their sensitivity to the land use assumption. User benefits should be estimated assuming fixed land use unless SEM is conducted (see section 3.4).

Dependent Development

4.2.9 In the case of dependent development, only user benefits should be estimated assuming fixed land use, all other impacts should be estimated under variable land use. Wider economic impacts associated with non-land market failures should be carefully considered as part of the economic narrative due to potential double counting (see section 4.3 for more information).

Dynamic Clustering and the Move to More/Less Productive Jobs

4.2.10 When estimating dynamic clustering and the move to more/less productive jobs, all other WEIs except for static clustering can be included in the analysis. Static clustering is captured within the estimation of dynamic clustering. Thus the estimation of total benefits will include wider economic impacts which explicitly quantify land use change as well as those which do not.

Full Variable Land Use

4.2.11 As discussed in section 2, the ‘rule of a half’ methodology is less accurate for the estimation of user benefits in the case of variable land use. If SEM is used, the results should be reported as an indicative monetised or non-monetised impacts compared with those derived from the ‘rule of a half’ methodology under the fixed land use. In addition, all impacts in the core scenario should be estimated assuming variable land use.

Supplementary Economic Modelling (SEM)

4.2.12 SEM may be undertaken if either market failures not captured in this guidance have been identified, if there are alternative sources of evidence which are considered more appropriate to the specific scheme context or if the WEIs under either fixed or variable land use are to be assessed. In the case of alternative evidence sources or methodologies, the results should be reported alongside those derived from the standard approaches in TAG Units A2.2 – A2.4 – see section 6 for more information.

4.2.13 Note in the case of variable land use, transport external costs should also be included in the estimation of total benefits.

4.3 User Benefits and Land Value Uplift

4.3.1 This section outlines how the user benefits associated with land use change may be approximated by land value uplift in the case of dependent development or through supplementary economic modelling.

Land Value Uplift

4.3.2 Land value uplift measures the difference between the price of land in its new and former uses and represents the private gain to land owners. It provides a convenient way of estimating the economic value of a development which is dependent on a transport intervention. It should only ever be used in the appraisals of dependent developments.

4.3.3 Land value uplift will capture any impacts which are capitalised into land values. It could potentially capture any of the following impacts: user benefits, land market distortions and other wider economic impacts, such as agglomeration economies that occur within that development.

4.3.4 In the case of dependent development the associated land value uplift will capture user benefits to new residents, which are missing from user benefits estimated under fixed land use; these can be considered additional to the fixed land use user benefits estimated via the 'rule of a half' methodology. Note land value uplift should only be estimated for those parts of the development which are dependent on the transport investment. However there are challenges associated with the use of land value uplift in transport appraisal:

1. Theory suggests the relationship between land rents and GTCs is ambiguous; land rents need not necessarily increase in response to GTC reductions, the response will depend upon the elasticity of substitution between land and other consumption goods (Arnott et al., 1981)

2. Land value uplift will capture any impacts capitalised into land, such that causal factors are ambiguous: it could potentially include the welfare associated with wider economic impacts and complementary interventions, which could potentially lead to double-counting or the false attribution of benefits respectively. For this reason consideration should be given in the Economic Narrative on the degree to which there is an overlap between land value uplift, direct transport benefits and other wider economic impacts; and

3. Land value uplift is a local site specific measure, as such it will not account for the loss of land value on other sites, which will occur if there is a relocation of economic activity. In other words it fails to account for displacement. Furthermore, there is a lack of robust evidence on displacement factors – the extent to which land value uplift at one specific

plot is at the expense of another area – which could lead to inaccurate estimates of the net land value change.

4.3.5 For these reasons, the scheme promoter should attempt to identify the causal factors driving the land value uplift, such as user benefit capitalisation, land market distortions or other wider economic impacts. The robustness of land value uplift as a measure of welfare will depend on the extent to which these factors have been identified and evidenced. It is included as an indicative monetised impact within the value for money assessment – see section 7 for details on reporting the land value uplift associated with dependent developments.

Supplementary Economic Modelling

4.3.6 For regeneration and transformational schemes, in which transport is only one of a number of interventions or the land use impacts are expected to be diffuse over the study area, it may be appropriate to undertake supplementary economic modelling.

4.3.7 Some supplementary economic models have the potential to quantify and value the user benefits associated with variable land use. However, due to the uncertainty surrounding these models, the results should be reported as indicative monetised impacts within the value for money assessment – see section 7 for more details on reporting the result from Supplementary Economic Models.

4.3.8 As mentioned in section 3, if significant land use change is forecast, the impact of this upon trip distribution and generation must be captured in the transport appraisal. This is to ensure the transport appraisal tells a consistent story in terms of the impact of the transport investment upon induced investment, employment effects and dynamic clustering and the transport network. This will ensure the transport flows and externalities, such as local air pollution and carbon emissions, accurately reflect the second round effects.

4.4 Gross Domestic Product (GDP) Analysis within Transport Business Cases

4.4.1 Indicative estimates of GDP can be derived from the welfare methodologies laid out in TAG A1 and A2 chapters; it does **not** require separate modelling. Table 4 demonstrates how the welfare estimates, derived from TAG, methodologies, relate to changes in GDP. For example, welfare analysis considers the benefits to all transport users (businesses, commuters and leisure travellers) but only business user benefits are considered commensurate to a change in Gross Domestic Product: leisure and commuter user benefits are not considered to change GDP because it is unclear the extent to which the former translate into economic impacts.

4.4.2 The GDP change can also be estimated using supplementary economic modelling. In such instances, the corresponding welfare change should be

derived – see Supplementary economic modelling M5.3 for guidance on estimating GDP and deriving welfare estimates.

4.4.3 If the GDP change is estimated it must be presented in an internally consistent format across the business case: the GDP analysis should adopt the same core assumptions, appraisal period, discount year, discount rate, price base and modelling of shocks as that of the welfare analysis.

4.4.4 The following table sets out the recommended approach for estimating GDP impacts from appraisal results. This draws on the work of Laird & Byett (2023).

Table 4 - Relationship of Welfare to GDP

	Welfare Impact	**GDP**
User benefits (1.3)	User benefits from business, commuting and leisure trips	Business user benefits plus user benefits from price reductions[6] for non-work travel
Induced Investment (A2.2) Dependent Development	Land Value Uplift (LVU)	LVU + 2 x development costs for residential development[7] Development costs only for commercial development. All estimates need adjusting for additionality.[8]
Induced Investment (A2.2) Output Change in Imperfectly Competitive Markets	13.4% of Business User benefits (incl. reliability benefits)	13.4% of Business User benefits (incl. reliability benefits)
Employment Effects (A2.3) Labour Supply Impacts	40% of change to GDP (tax revenue)	GDP (= welfare impact / 0.4)
Employment Effects (A2.3) Move to More/Less Productive Jobs	30% of change to GDP (tax revenue)	GDP (= welfare impact / 0.3)
Productivity Impacts (A2.4) Agglomeration Economies (incl. static and dynamic clustering)	Agglomeration Impacts	Agglomeration impacts

[6] Price reductions here refer specifically changes in market prices paid for travel, for example petrol prices, rail fares, or road tolls. It may not always be proportionate to split out the different elements of the user benefits calculation, in which case commute and other non-work user benefits should be assumed to not contribute to GDP at all. Please contact TASM@dft.gov.uk for further advice if required.

[7] Strictly speaking the GDP impact is the sum of development costs and the annual flows of housing rents (actual or imputed). These rental flows are quantify using existing information typically available from TAG appraisals. However, it may be expected that the present value of the rental income flow will approximately equal the GDV, so that the total GDP impact would be GDV + development costs – existing use value. This is equal to LVU + 2 x development costs, given that LVU = GDV – development costs – existing use value.

[8] The same additionality factor should be used for both GDP and welfare.

	Welfare Impact	GDP
Accidents (A4.1)	Based on VPF and injury values	15% of road accident impacts[9] Other modes: 30% of fatal injury impact, 10% of serious and 15% of slight
Physical Activity (A4.1)	Benefits calculated using the AMAT tool	Absenteeism benefits, plus 30% of the reduced mortality benefits
Air quality (A3)	Welfare impact taken from Defra AQ damage costs	20% of welfare impact[10]

4.4.5 There are a range of key caveats to note when carrying out this analysis:

- Residential rents (actual or imputed) contribute to GDP. Non-business user benefits could influence rental values, and therefore GDP. It is not currently possible to easily quantify this given the available evidence, so the approach to non-business user benefits above should be seen as giving a lower bound GDP impact.

- Any business user benefits (and price changes for non-business user benefits) associated with the new development contribute to GDP (even though the LVU is assumed to internalise them in welfare terms). These impacts cannot be estimated under standard fixed land use assumptions, so usually must be omitted, which will represent a slight under-counting of GDP impacts.

- There may be some impacts of noise which contribute to GDP, such as any impacts on mortality or productivity effects. However, given the usual scale of these impacts in appraisal it would not be proportionate to unpack these in most cases. Where a scheme has significant noise impacts, it may be proportionate to undertake bespoke analysis to estimate the GDP impacts associated with these. For example, working with Defra to understand the GDP pathways from the impact pathway modelling.

- For rail schemes or other non-road interventions with accident impacts, there is no simple rule of thumb which can be recommended. However, the proportions of fatal, serious and slight casualty costs in the table above can be used to help derive a bespoke estimate.

4.4.6 Public accounts impacts should not be included within GDP estimates calculated using the above approach. Rather, the GDP impact could be compared with the total public accounts impact to generate a ‘GDP to cost ratio’, or GCR. This would be calculated as the sum of GDP impacts divided by

[9] Based on the percentage of the welfare cost associated with each injury type (fatal, serious, slight and damage only) attributable to gross output losses.

[10] This is based on the Defra impact pathway guidance for air quality appraisal, specifically the ‘productivity’ and ‘chronic mortality’ rows. For chronic mortality, 30% of the welfare damage cost has been used based on the approach above for fatal injuries. The shares of NOx and PM in the total AQ damage cost is assumed to be in line with the AQ MECs for car travel (taken from TAG A5.4).

the (negative of) the sum of public accounts impacts from the AST. A lower GCR signifies a worse return on investment in GDP terms.

4.4.7 A GCR below 1 means the project has a low rate of return and would take a significant length of time to 'pay' for itself (in GDP terms). It is likely that a better GDP return could be obtained by the investing the money elsewhere. Note, there is no interpretation of the GCR in terms of 'Value for Money' categories, which are strictly reserved for welfare analysis. The GDP analysis discussed in this section is irrelevant to the VfM assessment, which is solely welfare based. GDP metrics should not be presented in value for money statements.

5. Defining the Scope of Analysis - Economic Narrative

Introduction to the Economic Narrative

5.1.1 The purpose of the Economic Narrative is to articulate why the transport investment is needed to achieve any economic objectives and how it is expected to achieve these. Through this process, the narrative defines the scope of the analysis in terms of the impacts to consider and the mechanisms through which these are expected to occur. The Economic Narrative sets out the context for the subsequent analytical methods required to capture and quantify the expected impacts, hence it should be included in the main body of the Economic Case.

5.1.2 In the early stages of developing an Economic Narrative, the analysis will be limited as the expected impacts may not yet be quantifiable. As the appraisal matures, the Economic Narrative should be iteratively developed in line with the availability of additional information and transparently presented. Transparent presentation refers to enabling a clear understanding of the assumptions, justifications and choice of analysis to allow for objective scrutiny.

5.1.3 The economic impacts of transport investment are context specific. The economic impacts depend on agents' responses to a specific shock (e.g. transport investment); in particular the capacity and capability of agents to take advantage of the opportunities made available and the relative size and scale of these opportunities relative to the base case. This has two implications for appraisal:

1. The inclusion of economic impacts within transport business cases should be considered an integral part of the appraisal design and not treated as an 'add-on' at the end of the process; and

2. When applying TAG in scheme appraisal, the approach taken should be selective and not mechanical; it should be applied on the basis of a scheme's expected economic impacts.

5.1.4 Given the importance of context specificity in understanding the economic impacts, the first stage of the appraisal process is the development of the Economic Narrative.

5.1.5 The Economic Narrative is the main tool through which scheme promoters articulate and justify why a transport investment is needed to achieve the economic objectives set out in the Strategic Case as well as defining and justifying the scope of the analysis. To this end, the Economic Narrative should include information on the following:

1. identification of the expected positive and negative economic impacts and a description of the extent to which these are expected to achieve any economic objectives in the Strategic Case, as well as any significant unintended economic impacts of the scheme;

2. justification of why these impacts are expected to occur on the basis of economic theory and context specific evidence;

3. identification of the welfare change associated with these impacts, arising, for example from market failures;

4. identification and justification of the proportionate level of analysis to quantify and value the impacts.

Identification and Justification of Expected Economic Impacts

5.1.6 Transport investments can have many varied economic impacts. Some may be specific objectives of the scheme, others may be unintended impacts. Not all economic impacts will be positive, some maybe negative. For example, if a scheme results in jobs relocating to other urban areas, this dynamic clustering effect may have negative productivity impacts resulting from disagglomeration economies. The Economic Narrative should identify and justify all significant positive and negative impacts which are expected to occur as a result of the scheme under consideration, such as economically inactive workers entering the workforce due to an increase in the net return of employment or disagglomeration effects such as the declustering of local businesses. The expected impacts should be justified on the basis of economic theory and context specific evidence, that is a transport investment could facilitate the achievement of the scheme's economic objectives, how such transport investment could support the wider development strategy as well as the availability of evidence from schemes with similar contexts. This should include any significant unintended impacts resulting from the scheme which do not form part of the economic objectives identified in the Strategic Case.

5.1.7 In addition to the quality of the analytical methods, the robustness and relevance of the economic theory and context specific evidence, used to identify and justify the expected economic impacts, will inform the weight placed on the analysis within the value for money assessment. Note that these are considered together with the results from the different levels of analysis when forming the value for money conclusion.

5.1.8 TAG Units A2.2 – A2.4 provide guidance on the type of information which could be presented in an Economic Narrative for the identification and justification of economic impacts including survey, evaluation and local growth plans. Appendices B and C indicate the headings that might be covered in a business questionnaire and data sources that may be useful when assessing regeneration impacts.

Identification of the Welfare Effects of Economic Impacts

5.1.9 Once the expected economic impacts have been identified, scheme promoters should identify the effect these will have on welfare.

5.1.10 The starting assumption of all transport appraisals is that the welfare effects of economic impacts are captured by user benefits. If there are market failures, user benefits will not fully capture all of the welfare effects associated with economic impacts, in other words there will be wider economic impacts.

5.1.11 The assessment and inclusion of wider economic impacts in the economic case should only be undertaken, if scheme promoters can identify and justify the presence of market failures. The types of information required to justify the presence of a market failure will depend on the particular market failure. For more information on valuing the welfare associated with economic impacts see section 4.

Identification of the proportionate level of analysis to quantify and value the impacts

5.1.12 Having identified the expected impacts, causal factors and the market failures, the scheme promoter should be clear about the highest desired level of analysis to be conducted (i.e. Levels 1, 2 or 3) and attention should be directed to the identification of appropriate and proportionate methods by which impacts are to be quantified and valued.

5.1.13 All Transport Business Cases should at a minimum conduct Level 1 analysis of user benefits and non-economic impacts. A decision to progress beyond this should be based on the expected economic impacts and market failures.

5.1.14 The impacts assessed in Levels 1 and 2 should be informed by a transport model, in which the model scenarios assume fixed land use. This will form the basis of the core scenario presented in the appraisal summary table – see Forecasting and Uncertainty M4 for guidance on developing the core scenario. The model outputs may be used to estimate the wider economic impacts associated with fixed land use or where land use change does not need to be explicitly quantified – see TAG Units A2.2 – A2.4.

5.1.15 Level 3 analysis should be considered if land use change is explicitly quantified, SEM is deemed appropriate or economic impacts are dependent on complementary interventions – see Forecasting and Uncertainty M4 for guidance on developing alternative scenarios. In the first instance level 3

impacts, such as dynamic clustering and the move to more/less productive jobs, should be estimated using the appropriate TAG methodologies, the results from supplementary economic models may be presented alongside these. Note in the case of supplementary economic models, the model choice will depend upon the specific impacts to be analysed – see TAG Unit M5.3 for guidance on model choice and the circumstances in which they may be applied.

5.1.16 All analysis is subject to uncertainty that will in turn affect the choice of methods to assess impacts. For more information on uncertainty refer to paragraphs 6.2.11 to 6.2.14 and TAG Unit M4.

5.1.17 The justification for the scope of the analysis should demonstrate the proportionality of the approach: the complexity, time and financial cost of developing and running complex analysis should be balanced against the potential effect the analysis will have on the VfM conclusion or our understanding of the impacts. Judgements on proportionality will differ depending on if a model already exists or if a model needs to be developed. In most instances, user benefits and wider economic impacts (level 1 and level 2 analysis) will be sufficient to inform the Transport Business Case. However, there may be transport investments for which the application of supplementary economic modelling is considered justified. Table 2 summarises the proportionate levels of analysis at which to capture impacts. For more information on proportionate appraisals, see Guidance for the Technical Project Manager.

6. Documenting Analysis – Economic Impacts Report

6.1.1 All Transport Business Cases which have economic objectives should be accompanied by an Economic Impacts Report (EIR) or a report with equivalent content. The EIR is a technical annex to the economic case which presents the analysis underlying the impacts reported in the economic case. The purpose of the EIR is to provide transparency of economic impacts analysis within the Transport Business Case, in order that it can be objectively scrutinised. Improving the transparency of economic impacts analysis is important for a number of reasons:

1. **Consistency between the welfare and non-welfare metrics:** The welfare and non-welfare metrics report the results of alternative approaches to value economic impacts. For any given scenario the welfare and non-welfare metrics should use a consistent set of assumptions and forecasts for the counterfactual; as well as the magnitude, nature and location of the economic impacts in response to a common shock, to ensure the Transport Business Case presents a consistent narrative. For example, the core scenarios of GDP and welfare analysis within a Business Case should have a single consistent forecast of employment effects.

2. **Contextual Information:** The counterfactual, shock and economic impacts are scheme specific. Given they are context specific, this should determine the analytical approach adopted and it should be set out why the analysis is relevant

3. **Uncertainty Analysis:** The results of all analysis are subject to varying degrees of uncertainty, as a result of the quality and availability of data, methods and unknown future economic shocks. The sensitivity of results to the underlying assumptions is key to understanding the analytical risks.

4. **Quality of Analysis:** The results of all analysis are subject to the quality of the methodologies used. Therefore the methodology should be transparently reported, such that its robustness and appropriateness can be examined and its inherent uncertainties can be distinguished from other potential weaknesses in the analysis.

6.1.2 The Economic Impacts Report should contain the technical analysis underlying the economic impacts such that stakeholders understand the derivation of the results and the key factors driving those results.

6.2 Technical Analysis

6.2.1 Key to improving the transparency of Transport Business Cases is the reporting of the analytical assumptions, justification and choice of methods in order that

results can be objectively scrutinised. Transparent reporting improves the understanding decision makers have in the strengths and limitations of the analysis underpinning value for money assessments.[11]The information requirement will partly depend upon the methods used and should be proportionate: generally supplementary economic modelling will be more information intensive than cases where the methodologies in TAG Units A2.2 – A2.4 have been applied. Below is a summary of the minimum level of technical information which should be provided in the EIR.

Quantification and Valuation Methodologies:

6.2.2 There should be a detailed description of the modelling and valuation methodologies used to analyse the economic impacts of transport investment. The description should outline the following information:

a) Model type
b) Model area – size of area represented in the model
c) Input data and source
d) Model mechanics – how the model utilises the input data to derive quantities/values
e) Modelled years and how results have been interpolated and extrapolated
f) Description of what quality assurance checks (e.g. audit, peer review) have been undertaken on the analysis

6.2.3 Some quantification and valuation approaches may only estimate impacts at the local level. On the other hand, some approaches may provide national impacts but an understanding of the local impacts would be desirable. Whether deriving a national impact from local impacts or vice versa, the methodology to do this should be clearly outlined together with the underlying assumptions.

6.2.4 For all transport schemes, the core scenario should be quantified and valued in line with the methodologies and approach set forth in TAG, such that reference to the relevant methodologies should suffice.

6.2.5 However, in those instances where supplementary economic modelling has been undertaken, such as to forecast land use in an alternative scenario, a full description will be required of the methodologies.

Results:

6.2.6 The presentation of the results should be unambiguous within the report; the impacts driving the results and the reasons for this should be clearly laid out. This may best be achieved by the presentation of a table of results, disaggregated by impact type, with accompanying explanatory text.

[11] https://www.gov.uk/government/publications/dft-analytical-assurance-framework-strength-in-numbers

6.2.7 As outlined in section 2.2, the core approach to appraise economic impacts is welfare analysis and the core scenario should be estimated using the methodologies set out in TAG units A1 and A2. If supplementary economic modelling has been undertaken to estimate welfare effects, the results should be presented alongside those derived from the TAG methodologies and any differences explained.

6.2.8 Where changes in GDP have been estimated, the net national effect should be presented alongside the corresponding welfare estimate and the differences reconciled; the association between the GDP and welfare estimates should be explained. In addition, if a local GDP change has been estimated, this should be presented and reconciled to the national GDP and welfare estimates. It should be noted that measures of GDP and measures of Gross Value Added (GVA) are related but not additional, GDP is measured in market prices whereas GVA is measured in factor prices. Measures of the estimated impacts should be converted to a common price level for the purposes of reporting an overall impact. The estimated GDP impact of a transport investment should be adjusted for inflation and reported as a net present value.

Key Assumptions and Parameters:

6.2.9 All of the key assumptions and parameters driving the results should be presented, together with sources and their implication within the analysis – example in Box 4.

Box 4: Example of Information Requirement for Key Assumption

The manufacturing agglomeration elasticity (0.021) describes the increase in productivity as a result of an increase in access to economic mass (i.e. effective density) of the urban area. If effective density increases by 1% as a result of a reduction in generalised travel costs and/or the relocation of employment, productivity will increase by 0.02%. Source: Graham, D., J., Gibbons, S., Martin, R., (2009) *'Transport Investment and the Distance Decay of Agglomeration Benefits'.*

6.2.10 The identification of key assumptions is particularly important when supplementary economic modelling has been undertaken and a full account should be provided. Where TAG has been followed, reference should be made to the unit, which contains the relevant assumptions.

Understanding Uncertainty:

6.2.11 Economic impacts are always uncertain. Uncertainty surrounds the counterfactual, nature of a shock and the response of different economic agents to a shock. Its extent depends on the quality and availability of data; as well as the quality of analysis. This uncertainty should be reflected in the reporting of impacts, so that stakeholders have a fuller understanding as to the sensitivity of results to the underlying assumptions.

6.2.12 Within each level of analysis it is important to understand the range of impacts and the associated uncertainty. This can be informed by developing an uncertainty log – see TAG Unit M4.

6.2.13 Uncertainty analysis should be performed on all of the key assumptions, setting out the likelihood that different outcomes may occur. The uncertainty analysis should ideally be informed by evidence, however, in some circumstances this may not be possible.

6.2.14 In many instances assumptions are derived from empirical evidence. The uncertainty analysis that could be performed in such instances includes the use of confidence intervals from the empirical evidence or alternative empirical sources. If there are no alternative sources of empirical evidence, the analyst will need to consider what would be an appropriate sensitivity test. For more information about uncertainty and how it should be reflected in appraisal see TAG Unit M4, and supplementary TAG uncertainty toolkit and common analytical scenarios.

Quality of Analysis:

6.2.15 If SEM is undertaken, the analysis should be presented in the Economic Impacts Report. In addition to the requirements laid out above, information should be provided regarding how the analysis has applied the analytical principles set out in TAG Unit M5.3.

Informing the welfare and non-welfare measures

6.2.16 The detailed technical information contained in the Economics Impact Report should be reported as welfare and non-welfare measures within the main body of the Economic Case. Where they usefully inform the extent to which economic objectives are met, non-welfare measures may be referenced in the Strategic Case.

6.2.17 Given the plethora of factors which determine the magnitude and type of economic impact, uncertainty analysis should be summarised and ranges around the central estimates reported for both the welfare and non-welfare measures.

7. Reporting Impacts

7.1 Introduction

7.1.1 This section outlines the various reporting criteria of economic impacts within the Transport Business Case. The section is structured as follows:

- Section 7.2 outlines where the different approaches to value economic impacts should be reported within the Transport Business Case;
- Section 7.3 explains how economic impacts should inform the value for money (VfM) assessment; and
- Section 7.4 explains how non-welfare measures should be reported within the Transport Business Case.

7.2 Reporting Impacts within the Transport Business Case

7.2.1 The purpose of analysing the economic impacts of transport investment is to inform the decision-making process. Decision-makers are presented with a Transport Business Case which contains all of the evidence regarding the potential costs and benefits of the scheme under consideration.

7.2.2 The Transport Business Case is composed of five cases: the Strategic, Economic, Financial, Management and Commercial Cases. The two cases of most relevance to analysis of economic impacts are the Strategic and Economic Cases. The former contains the policy objectives of the transport investment and evidence should be presented which informs the extent to which these are achieved; non-welfare measures of economic impacts, such as GDP, may be referenced, if they usefully inform the economic policy objective. The latter presents evidence on the value for money of the different options and is where the welfare associated with economic impacts, as measured by user benefits and wider economic impacts, should be reported. Any non-welfare measures referenced in the Strategic Case must also be reported in the Economic Case to ensure consistency with the welfare measures. Note: if the analysis suggests the economic impacts will affect the broad transport budget, such as increased ticket revenue, these effects should also be reported in the Financial Case.

7.3 Reporting Welfare Measures of Economic Impacts

7.3.1 This section provides guidance on where within the value for money assessment the welfare associated with economic impacts should be reported as summarised in Table 2 – see value for money guidance on how to form value for money conclusions.

7.3.2 The impacts reported in the Economic Case inform the value for money assessment. The value for money assessment examines the relationship between the costs of the transport investment and the expected impacts, such as economic, environmental, social and distributional, of all options.

7.3.3 Within the value for money assessment of the Economic Case, the geographical scale at which impacts are reported must always be national, that is, the United Kingdom. Therefore, when assessing the welfare change associated with economic impacts, one must consider impacts which fall outside of the area of immediate interest.

7.3.4 As mentioned in section 2, one of the potential impacts of a transport investment is the relocation of economic activity. The relocation of economic activity means that one area gains at another's expense, such that the change

in the level of economic activity is greater at the local than national level. Thus a local focus will tend to exaggerate the magnitude of economic impacts and the associated welfare change.

7.3.5 Within the value for money assessment, impacts are differentiated on the basis of their maturity; progression through the levels of analysis corresponds to a decreasing level of maturity and robustness.

Level 1 – User benefits

7.3.6 The starting point of the value for money assessment is the estimation of user benefits assuming fixed land use, such that there are no feedback effects from secondary markets. As mentioned in section 2, this will miss the user benefits arising from changes in the level and location of economic activity. Nevertheless, this is considered a reasonable proxy, because for the majority of schemes the feedback effects will not be significant compared to the total travel demand change.

7.3.7 As the methodology to quantify and value user benefits is well-researched and robust, the results are reported in the initial BCR; this forms the foundations of the value for money assessment.

Level 2 – Inclusion of Wider Economic Impacts (Connectivity Impacts)

7.3.8 The next stage – where relevant to the scheme – is the incorporation of any wider economic impacts as specified in TAG Units A2.2, A2.3 and A2.4, output change in imperfectly competitive markets, labour supply impacts and static clustering respectively.

7.3.9 These can all be added to the transport market effects to estimate the adjusted BCR which reflects the fact the methodologies are not as established as those in level 1.

Level 3 – Inclusion of Wider Economic Impacts (Structural and context specific Impacts)

7.3.10 Level 3 analysis includes structural impacts, wider economic impacts explicitly forecasting and valuing land use change in response to transport investment; user benefits under changing land use; and the assessment of market failures for which there are no methodologies in TAG. Within TAG we provide methodologies to estimate dependent developments, dynamic clustering and the move to more/less productive jobs. Additionally, we provide guidance for the modelling of structural impacts – see TAG Unit M5.3.

7.3.11 The methodologies to estimate level 3 impacts are often subject to a high degree of uncertainty; for example, forecasting land use change is particularly uncertain and there is little evidence to validate forecasts. For this reason they should be reported as indicative monetised impacts – these can be included in the indicative BCR (subject to certain criteria being met) – or non-monetised

impacts in the value for money assessment. These are considered alongside the initial and adjusted BCRs as part of the VfM assessment which also takes a holistic view of the costs and benefits. See value for money guidance for more information.[12]

Sensitivity Tests

7.3.12 Sensitivity tests may be undertaken using new evidence sources to inform different assumptions from those underlying the methodologies in the core TAG scenario, such as local level agglomeration elasticities. The different technical units of TAG (A2.2, A2.3, A2.4 and M5.3) have information on undertaking specific sensitivity tests and their results should be reported as sensitivity tests in the value for money assessment.

7.4 Reporting Non-Welfare Measures of Economic Impacts

7.4.1 Welfare and non-welfare measures are reported in the Economic Case. The Economic Impacts Report should detail all of the technical analysis underlying the measures reported in the Economic Case. In certain circumstances, non-welfare measures, estimated in the Economic Case, may be referenced in the Strategic Case if they can usefully inform the extent to which an economic objective will be met. For example, an economic objective to boost local employment levels may be best informed by expectations of the number of new local jobs that will be created by a scheme. Where local non-welfare measures are reported, the net impact on the national non-welfare measure must also be reported.

7.4.2 Welfare and non-welfare metrics are different measures of impacts resulting from a scheme. Non-welfare measures, such as GDP may provide contextual information on the drivers of the welfare measures, such as the change in GDP associated with labour supply impacts. In reporting non-welfare metrics these must be reconciled with and reported alongside the welfare metrics. It should be clearly presented within the Economic Case and Appraisal Summary Tables that the non-welfare measures are not additive to welfare measures. See section 4 for information on presenting non-welfare measures in the Economic Case.

7.4.3 If reporting non-welfare measures of economic impacts, the following principles should adopted:

1. **The choice of metric should be informed by the economic objectives**

   Within the Economic Case welfare is the primary metric used to value economic impacts. This serves a specific purpose to inform the value for money assessment. In some cases, non-welfare measures, such as the change in GDP, may better inform the extent to which economic objectives as identified in the Strategic Case are met such as employment growth or boosting economic activity to a regeneration area, non-welfare measures

[12] https://www.gov.uk/government/publications/dft-value-for-money-framework

must be drawn from the same technical analysis underlying welfare impacts.

2. **Analysis of non-welfare measures should be consistent with that of welfare measures.**

   The analysis used to estimate non-welfare measures should be consistent with the analysis of welfare measures. This process of demonstrating that welfare is related to non-welfare measures is what we refer to as reconciliation. The scenarios used to estimate non-welfare measures should be the same as those used to estimate welfare measures in terms of the magnitude, nature and location of economic impacts and the underlying assumptions, such as population, employment and workforce skills. Estimation of non-welfare measures should use the same core assumptions, appraisal period, discount year, discount rate, price base and modelling of shocks as that of the welfare analysis.

3. **The core scenario of economic impacts should use the TAG methodologies.**

   The core estimate of welfare and non-welfare measures should use the TAG methodologies set out in User and Provider Impacts (A1.3) and Wider Economic Impacts (A2). Table 4 outlines how the GDP change can be derived from the welfare estimates.

4. **Sensitivity tests for non-welfare measures of economic impacts must be undertaken for the corresponding welfare measures.**

   Sensitivity tests around the core scenario may be undertaken to improve understanding around the potential range of economic impacts associated with a transport investment. These tests and their results must be presented for both non-welfare and welfare metrics.

5. **Local economic impacts should only be reported alongside the corresponding national impact.**

   The economic objective may be locally focussed, such as the regeneration of a local area. In this instance, it would be appropriate to report local impacts. Nevertheless, the corresponding national impacts should be reported alongside to aid transparency: reporting the national and local economic impacts together clarifies the extent of the assumed relocation (displacement) of economic activity.

8. References

Arnott, R. J. & Stiglitz, J. E. (1981), "Aggregate Land Rents and Aggregate Transport Costs," Economic Journal, Royal Economic Society, vo. 91 (362), pages 331-347, June

Department for Transport, "Value for money framework" (2024), https://www.gov.uk/government/publications/dft-value-for-money-framework

HM Treasury, "The Green Book", (2022), https://www.gov.uk/government/publications/the-green-book-appraisal-and-evaluation-in-central-governent

Laird, J. & Byett, A. (2023) Relating transport appraisal to GDP impacts. Final Report to the Department for Transport

Venables, A., et al, (2014); "Transport investment and economic performance: Implications for project appraisal" https://www.gov.uk/government/collections/transport-appraisal-and-strategic-modelling-tasm-research-reports

Appendix A: Appendix A Glossary

Additionality – the extent to which local economic performance impacts are additional at the national level, gross and net effects respectively. Impacts of Government interventions are described as 'additional' if the net increase in economic performance takes into account deadweight, displacement and leakage.

Additionality models – Models estimating the impact of transport schemes on net economic performance by calculating the private benefit then adjusting for deadweight, displacement, leakage and multiplier effects.

Agglomeration – this represents one of the mechanisms by which transport schemes can boost social welfare by raising the productivity of businesses due to better links to other businesses and sources of labour.

Central approach – recommended methods to appraise the economic performance impacts of transport schemes detailed in Units A2.2-A2.4 of TAG.

Closure rules – assumptions applied to supplementary economic models in order to impose supply-side constraints (e.g. assuming a transport scheme has no impact on total employment).

Deadweight – this describes the situation in which a rise in economic performance is expected to occur in both the do-something (with-scheme) and the do-minimum (without-scheme) scenarios.

Dependent developments – developments which are expected to gain planning permission in the do-something (with-scheme) scenario but not in the do-minimum (without-scheme) scenario. There should be a clear intention to develop a specific site.

Displacement – the extent to which economic activity is relocated from one area to another. Displacement can occur in labour, capital and product markets.

Economic performance – this refers to the level and/or growth of economic activity in an area. This includes metrics such as employment, investment, productivity and output.

Econometric model – Models to estimate the impact of transport schemes on economic performance based on empirical relationships between economic performance and accessibility.

Gross domestic product (GDP) – this is a measure of the value of goods and services produced in an economy within a specific time period. This is measured in market prices.

Gross value added (GVA) – this is a measure of the monetary value of goods and services produced in an area, industry or sector of an economy. GVA is equal to gross domestic product (GDP) minus taxes on products plus subsidies on products. This is measured at factor costs.

Investment and Employment effects - changes in the level and spatial distribution of investment and employment resulting from a transport scheme.

Land use change – refers to changes in the purpose and/or intensity of usage.

Land use transport interaction (LUTI) models - models estimating the impact of transport schemes on economic performance, taking into account the interactions between the real economy and the transport network.

Leakage – this describes the extent to which an increase in economic performance falls outside the target area of the scheme.

Movement to more productive jobs – this represents the increase in tax associated with jobs relocating to more or less productive areas as a result of transport improvements.

Multiplier effects – this describes the extent to which an increase in economic performance is propagated into a larger impact as a result of increased supply-chain and consumer spending.

Productivity impacts – the impact of transport investments on the efficiency with which the factors of production (such as land, labour and capital) are used in the production process: productivity may increase because either fewer factors of production are required to produce a unit of output or there is a reallocation of the factors of production towards higher value added activities.

Social Welfare – a measure of the overall wellbeing of society taking into account economic, social environmental considerations.

Spatial Computable General Equilibrium (SCGE) model – models estimating the impact of transport schemes on the economic performance taking into account the spatial interactions between households and businesses.

Supplementary economic modelling (SEM) – approaches used to estimate the economic impacts of transport interventions. This includes basic SEMs, such as Additionality models or Reduced-form models, and advanced SEMS, such as Land Use and Transport Interaction (LUTI) models, Spatial-Computable General Equilibrium (SCGE) or Quantitative Spatial Economic (QSE) models. See TAG Unit M5.3 for more detail.

Transformational Scheme – a transport investment that significantly affect the capacity of national transport infrastructure and/or regional attractiveness. Transformational schemes vary in size and geographic impact – from major schemes which have regional and national impacts which likely require central Government financing, to smaller schemes that can be transformative at a local

level. There are many definitions of transformation.[13] HMT Green Book defines transformation as a "practically irreversible change in a system that causes self-sustaining internal feedback effects that result in continuing change, or a new stable state, but not reversion to the original state."

User benefits – a measure of the direct welfare impacts of transport investments on transport users, such as reductions in vehicle operating costs and journey time savings.

[13] See DfT Commissioned research: Arup (2023), Understanding and Quantifying Transformational Impacts from Transport Interventions: literature review.

Appendix B: Questionnaires for Business Interviews

B.1.1 Table B1 overleaf indicates the headings that might be covered in a business questionnaire for assessment of economic impacts. The wording should be adapted as appropriate.

B.1.2 Two features of the questionnaire might be noted:

- It does not focus exclusively on transport, but tries to cover a range of topics that might affect how well the business is performing, to avoid excessive weight being given to transport issues in the responses;
- It explores the importance of transport to the business, but does not ask directly how many new jobs would appear if the proposed transport scheme were built. This might be thought a valid question, and perhaps in cases where investment plans are well advanced it may well be, but in general the answers to such questions will not carry much credence and are best avoided.

B.1.3 The sampling process for selecting businesses will depend on the circumstances of each case. However it is likely that in many cases the number of interviews may be a few tens, rather than hundreds, and it is therefore important that they be used as efficiently as possible. Random sampling is unlikely to be effective, for example, unless the sample sizes are large, since the risk is that time will be spent interviewing businesses that are not transport dependent.

B.1.4 It would be better to consider the local economy and identify those businesses that are dependent on transport and whose activities may benefit from the scheme. A pre-screening exercise should identify these. They are likely to include manufacturers and haulage companies, for instance.

B.1.5 If this process is followed then it will be necessary to re-weight the survey responses to reflect the prominence of the sampled businesses in the study area. Information should be used about the number of businesses of the type interviewed that there are in the study area, to give an indication of the number of businesses involved, the number of people they employ etc, and their significance as local employers. Any re-weighting system should be explained and justified; this includes any decision not to re-weight.

Table B1 Outline Business Questionnaire

Topic	Questions
Contacts etc	Name of company; Details of person contacted; Nature of business Turnover at this site Location of other sites
Employees	Numbers employed at this site, split by grade/skill; Has this increased/decreased over the past year? Typical staff turnover rate/ numbers recruited per year; Expectations for staff numbers in coming year; Any particular difficulties over recruiting.
Customers, suppliers, competitors	Where are principal customers and suppliers located? Where are principal competitors located?
The sector	Prospects for the business sector; Reasons for expected growth or decline; Expectations for this business: growth, static, decline; reasons.
This location	How long have they been here? Strengths and weaknesses of location; Intentions regarding staying at site/expanding/contracting; Likelihood of relocation and reasons; What would improve this location for the business? (Could prompt: access to staff, suppliers, markets; competition; transport costs; availability of suitable land or premises; availability of capital; other)
Movement of goods	Is this important to the business? Describe, distinguishing outward and inward movements; Carry own goods, or use haulage companies? Costs of moving goods: absolute; % of turnover; % of profit Incidence of delays, and consequences for business
Movement of staff	Modes used; From where do staff travel in to work? Problems or strengths of location
Business travel	Numbers of trips; Modes used; Destinations; Any issues (times, costs, reliability etc)
Tourism only	Number of visitors per year (maybe by season); Average spend per visitor; Where do visitors come from? Particular strengths and weaknesses of the location.

Appendix C: Data Sources and Definitions

Introduction

C.1.1 This Appendix provides advice on data sources that may be useful when preparing an economic narrative. It is not intended to be an exhaustive survey of sources, but reflects the experience gained from applying the Guidance to real schemes.

C.1.2 Each of these is discussed separately below.

Transport Network

C.1.3 An important part of an assessment of economic impacts will generally be to calculate travel times and costs between zones in the study area and:

- Other zones in the study area;
- The same zone, ie travel within each zone; and
- Other zones in the study area hinterland.
- These will be required for car, public transport and walk.

C.1.4 For larger schemes, it is likely that a transport model will already have been built, and this should be capable of providing the information required for mechanised modes fairly readily, although such models do not always allow for travel within zones and suitable times and costs may have to be estimated separately.

C.1.5 Even if a model has not been built, it is worth considering using network-building software to generate the information required for the economic narrative. This is because the procedures for setting up these models are well established, and the software is designed to produce exactly the information required quite efficiently.

C.1.6 However, in the absence of such a model, the possibilities include the following.

- **Private car - Maps and ruler**. This has its place, but is unlikely to be practical for any but the smallest schemes.
- **Public transport timetables**. These are feasible, but rapidly become time consuming as the network density builds up.
- **Journey Planners**. Transport Direct is a journey planner service provided free at point of use via the internet, that provides options for journeys, and estimated journey times, by car and public transport, for trips between origins and destinations specified by the user. There are also other products that are commercially provided, often via the internet, that can be used to calculate expected free-flow drive times between given origin and destination pairs.

Employers and jobs

C.1.7 The Annual Business Inquiry (ABI) can be used to provide estimates of the number of jobs by Ward or Postcode, split by Standard Industrial Classification (SIC).

C.1.8 The ABI can be accessed via an online service called NOMIS, that is provided by the Office for National Statistics.

C.1.9 The system for mapping SIC to skill levels will be required. Tables C1 and C2 illustrate how this might be done (they were used in case studies while preparing this guidance). The first maps SIC to SEG group, and the second maps SEG to each of four skill levels.

C.1.10 Information about vacancies is typically only available at District level, based on reports from Job Centres. Such estimates of vacancies will be skewed towards some sectors more than others, and do not provide a complete picture of the range of vacancies. They will have to be supplemented with information from elsewhere, including any businesses surveys carried out in the RA audit.

Table C1: mapping between SIC and SEG

		SICS																			
		1 Agric. etc.	2 Fishing	3 Mining, quarrying	4 Manufacturing	5 Energy, water	6 Construction	7 Wholesale, retail and motor trade	8 Hotels and restaurants	9 Transport, storage and communication	10 Financial	11 Real estate, renting & bus. activities	12 Public admin. and defence	13 Education	14 Health and social work	15 Other community, social and personal	16 Private hholds with employed persons	17 Extra-territorial organisations	18 Workplace outside UK	20 DNA (never worked)	21 Pre-Q2 1995
SEGs	1 Employer: large	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2 Manager: large	0	0	7	9	14	5	6	5	8	16	8	15	11	8	4	0	27	33	0	0
	3 Employer: small	1	3	2	1	0	5	5	7	2	0	1	0	0	0	3	0	0	0	0	0
	4 Manager: small	2	3	4	4	3	4	8	6	5	10	9	3	4	4	6	0	0	0	0	0
	5 Profess.: self-employed	0	0	1	1	0	0	0	0	0	0	5	1	0	2	1	0	0	0	0	0
	6 Profess.: employee	1	0	4	5	7	5	0	0	2	5	11	5	5	4	4	1	0	0	0	0
	7 Intermediate non-manual	1	0	4	6	8	3	2	1	3	9	12	13	38	30	12	4	36	17	0	0
	8 Supervisor of non-manual	0	0	1	2	5	1	6	0	4	10	5	9	1	1	2	0	0	17	0	0
	9 Junior non-manual	6	13	6	13	24	9	45	7	20	44	24	35	7	12	16	0	18	17	0	0
	10 Personal service	0	0	3	2	1	0	1	46	2	0	1	2	19	6	16	23	0	0	0	0
	11 Foreman of manual	3	3	8	7	13	7	2	1	6	0	2	1	1	3	2	1	0	0	0	0
	12 Skilled manual	2	28	32	21	11	23	8	1	24	1	3	2	0	2	4	0	0	0	0	0
	13 Semiskilled manual	8	31	24	22	9	6	5	4	13	1	6	4	2	18	13	8	9	0	0	0
	14 Unskilled manual	1	0	3	4	5	8	2	15	5	1	6	4	9	8	9	39	0	0	0	0
	15 Own account non-profess.	5	19	1	2	0	23	6	5	7	1	5	0	1	2	7	22	0	17	0	0
	16 Farmer: employer/manager	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	17 Farmer: own account	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	18 Agric. worker	44	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0
	19 Armed forces	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	9	0	0	0
	21 NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
	22 DNA (Never worked)	1	0	0	0	0	0	2	3	0	0	0	0	0	0	1	1	0	0	100	92
	Total	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Table C2 Mapping between SEG and Skill Levels

SEGs	Skills Groups
1 Employer: large	Professional/Managerial
2 Manager: large	Professional/Managerial

3 Employer: small	Professional/Managerial
4 Manager: small	Professional/Managerial
5 Professional: self-employed	Professional/Managerial
6 Professional: employee	Professional/Managerial
7 Intermediate non-manual	Office
8 Supervisor of non-manual	Office
9 Junior non-manual	Office
10 Personal service	Skilled Manual
11 Foreman of manual	Skilled Manual
12 Skilled manual	Skilled Manual
13 Semiskilled manual	Low Skilled Manual
14 Unskilled manual	Low Skilled Manual
15 Own account non-professional	Skilled Manual
16 Farmer: employer/manager	Professional/Managerial
17 Farmer: own account	Skilled Manual
18 Agricultural worker	Low Skilled Manual
19 Armed forces	Skilled Manual
21 NA	Low Skilled Manual
22 DNA (Never worked)	Low Skilled Manual

Tourism

C.1.11 Two sources to aid the measurement of tourism and its impact in a region are the Cambridge Economic Model and the Scarborough Tourism Economic Activity Model (STEAM). One or other of these models is often commissioned by local authorities or tourist boards and can be obtained from them. Both are concerned with estimating the ‘size’ of the tourism market, in terms of visitors and employment, although they vary in their data collection method for tourism volume - 'top down' (disaggregating national data) for the former and 'bottom up' (local supply-side led) for the latter.

C.1.12 Key outputs include estimates of tourism numbers, expenditure and employment. In STEAM these are subdivided into serviced and non-serviced accommodation, visiting friends and relatives, and day visitors, but are not divided geographically. From these figures indicative relationships between visitors and employment can be derived. Where possible such relationships should also be supported by empirical research however since, as noted above, the models are intended for trend purposes and not absolute measurements. It was found in the case studies, for example, that if the changes in visitor numbers were small, businesses were likely to accommodate the change by working longer hours, rather than taking on new staff.

Definitions

C.1.13 The following definitions used by the Office for National Statistics (ONS) and in the data sources above.

The Workforce. These are people who are either in work, or who are available for work. The latest Census data will provide a source of information.

Employment. There are two main ways of looking at employment: the number of people with jobs or the number of jobs. These two concepts represent different things as one person can have more than one job. People aged 16 or over are classed as in employment (as an employee or self-employed) by the LFS, if they have done at least one hour of paid work in the week prior to their LFS interview or if they have a job that they are temporarily away from. People who do unpaid work in a family business and people on Government-supported training and employment programmes are also included according to the International Labour Organisation (ILO) convention.

Workforce Jobs. Information on the number of jobs is mainly collected through postal employer surveys. This gives the number of employee jobs (formerly known as employees in employment). The total number of workforce jobs (formerly known as workforce in employment) is calculated by summing employee jobs, self-employment jobs from the LFS, those in HM Forces and Government-supported trainees. Vacant jobs are not included.

Civilian Workforce Jobs. Workforce jobs excluding those in HM Forces.

ILO Unemployment. The ILO definition of unemployment covers people who are: not in employment, want a job, have actively sought work in the previous 4 weeks and are available to start work within the next fortnight, or, out of work and have accepted a job which they are waiting to start in the next fortnight.

Claimant Count. The claimant count records the number of people claiming unemployment-related benefits. These are currently the Jobseeker's Allowance (JSA) and National Insurance credits, claimed at Employment Service local offices. People claiming JSA must declare that they are out of work, capable of, available for and actively seeking work during the week in which the claim is made. They enter into a Jobseeker's agreement setting out the action they will take to find work and to improve their prospects of finding employment.

Economically Active. The economically active population are those who are either in employment or ILO unemployed.

Economically Inactive. Economically inactive people are not in employment, but do not satisfy all the criteria for ILO unemployment. This group comprises those who want a job but who have not been seeking work in the last 4 weeks, those who want a job and are seeking work but not available to start and those who do not want a job. For example, students not working or seeking work and those in retirement are classed as economically inactive. It can be useful for some purposes to consider only those who are both economically inactive and of working age.

Labour Market Attachment. A concept relating to a person's proximity to the labour force. It covers a spectrum from fully attached workers (e.g. those in employment or ILO unemployment) at the one extreme, to those who do not want a job at the other extreme. The latter group, which includes economically inactive retired people, might be considered completely detached from the labour market.

Discouraged Workers. A subgroup of the economically inactive population who said that they would like a job and whose main reason for not seeking work was because they believed there were no jobs available.

Rates. Rates represent the proportion of the population or subgroup of the population with a certain characteristic. They allow changes in the labour market to be interpreted in a wider context, allowing for changes in the overall population or the number of people who are economically active. Rates can be calculated for different age groups. For employment, economic activity and economic inactivity, the most widely quoted rates are those for the working age population i.e. men aged 16-64 and women aged 16-59. For ILO unemployment, headline rates are expressed as a percentage of the economically active population aged 16 and over. Those over retirement age who continue to be economically active will therefore be included in the base while those who are economically inactive will not.

Employment Rate. The number of people in employment expressed as a percentage of the relevant population.

ILO Unemployment Rate. The number of ILO unemployed people expressed as a percentage of the relevant economically active population.

Claimant Count Rate. The number of claimants resident in an area expressed as a percentage of the sum of claimants and workforce jobs.

Economic Activity Rate. The number of people who are in employment or unemployed expressed as a percentage of the relevant population.

Economic Inactivity Rate. The number of economically inactive people expressed as a percentage of the relevant population.

Earnings. A measure of the money people receive in return for work done gross of tax. It includes salaries and bonuses but does not include non-monetary perks such as benefits in kind. This differs from income, which is the amount of money received from all sources. Income includes interest from building society and bank accounts, dividends from shares, benefit receipts, trust funds, etc.

Jobcentre Vacancies. A job opportunity notified by an employer to a Jobcentre (including 'self-employed' opportunities created by employers) which remained unfilled on the count day (the reference day for each month's statistics - normally confined to the first Friday in the month).

Indices of multiple deprivation (IMD). An official measure of relative deprivation for small areas in England. It considers income; employment;

education, skills and training; health disability; crime; barriers to housing and services; and, living environment deprivation.

Dataset names and abbreviations

C.1.14 The following dataset names and abbreviations are commonly used.

- AABI Annual Business Inquiry
- AES Annual Employment Survey
- ES Employment Service
- GOR Government Office Region
- IDBR Inter Departmental Business Register
- ILO International Labour Organisation
- JSA Job Seekers Allowance
- LADB Labour Force Survey Annual Local Area Database
- LEA Local Education Authorities
- LEC Local Enterprise Companies
- LFS Labour Force Survey
- LLP Lifelong Learning Partnerships
- LMT Labour Market Trends
- NES New Earnings Survey
- NUTS Nomenclature of Units for Territorial Statistics
- OECD Organisation for Economic Co-operation and Development
- PC Parliamentary Constituency
- QS Labour Force Survey Quarterly Supplement
- RFR Regional First Releases
- SIC Standard Industrial Classification
- SOC Standard Occupational Classification
- SSR Standard Statistical Regions
- STES Short Term Employer Surveys
- TEC Training and Enterprise Councils
- TTWA Travel-to-Work Areas