Appraisal of Sustainability

Economy Indicators

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1 Introduction

This report is one of a set of three describing the development of sustainability indicators for use in transport planning and policy. The work presented in this report considers the economy dimension of the sustainability assessment. The social dimension is presented in Lucas and Brooks (2005) and the environment dimension in Marsden (2005). Together, these three reports mark the end of stage one of a two-stage research project, whose aim is to develop an improved method by which to assess the sustainability of decisions about, or that impact on, the transport system (Marsden *et al* (2005a)). The second stage of the project will test the application of these indicators to UK-based case studies.

Sustainable development has grown in importance since the Brundtland report (WCED, 1987), which defined sustainable development as "*Economic and social development that meets the needs of the current generation without undermining the ability of future generations to meet their own needs*". A number of alternative definitions have been developed since the Brundtland report, and in these a dominant theme has been what the 2002 World Summit on Sustainable Development called the three "interdependent and mutually reinforcing pillars of sustainable development — economic development, social development and environmental protection" (UN, 2002). The concept of sustainability has also been applied to specific sectors of the economy. Thus in transport, for example, ECMT (2001) defines economically sustainable transport as transport which: "Is affordable, operates fairly and efficiently, offers a choice of transport mode, and supports a competitive economy, as well as balanced regional development". Meanwhile, the UK government's sustainable development strategy 'Securing the future' Defra (2005) focuses on sustainable consumption and production as the basis for defining the sustainable economy. Using these and other definitions, a number of 'sustainability indicator sets' have been produced – for example, by WBCSD (2004), DETR (1999) and ODPM (2004).

We have found during this research that there are still multiple views of what sustainability is and how it should be represented ranging from 'weak' to 'strong' sustainability (Kelly, 2005). Rather than furthering this debate, we have attempted to operationalise current agreed definitions and to employ available indicators where possible to ensure that the approach is consistent with UK government policy and is practicable. Marsden *et al* (2005a) set out our overall approach.

The key aim of the economy indicators selected in this report is to provide a gauge with which to measure the trajectory of economic performance in the medium to long term, and to compare this with the requirements of a 'sustainable economy' – as defined by the chosen sustainability concept. Section 2 describes the method by which the indicators were selected. Section 3 describes how the indicators would be used with real data and models for transport policies and projects, to provide the economic part of a sustainability assessment. Section 4 gives additional detail on the chosen indicators. Section 5 outlines the findings of a stakeholder consultation on these indicators. Section 6 gives recommended revisions to the indicators in light of stakeholder views. Section 7 contains the conclusions.

2 Methodology for indicator selection

This section describes the method used to select the economy indicator for the sustainable appraisal framework.

2.1 Area of focus

After reviewing possible sustainability definitions and indicator sets (Kelly, 2005), it was decided that the starting point for our approach to the economic dimension of sustainability should be the Brundtland Commission definition (WCED, 1987) given in Section 1 above. For practical purposes it was chosen to interpret the Brundtland Commission's understanding of economic sustainability as:

*A desire to ensure that the **standard of living** in the future is better or at least not worse than the present day.*This principle requires that the economy indicators need to be developed to allow policies and projects that meet/violate the constraint of non-decreasing standard of living to be identified.

2.2 Development of the economy indicator

An initial list of potential economy indicators was drawn-up, based on a literature review (Kelly, 2005), which included all the indicators which attempted to capture the link between transport policies and projects and the economy. Key sources for this included sustainability indicator sets reflecting UK government policy such as Defra (2005), ODPM (2004), Defra (2004) and DETR (2000), alongside research considering explicitly the link between transport and the economy including SACTRA (1999) and Venables and Gasiorek (1996).

The literature review highlighted the widespread use of Gross Domestic Product (GDP) as an economy indicator within sustainable development frameworks, which provides a measure of the value of goods and services traded in the economy. If GDP increases then the economy is said to be 'growing'. There are some fairly well-known problems, however, with GDP as a measure of the standard of living, which we sought to address.
The indicator GDP was not originally designed as an indicator of standard of living, but over time has taken on this role. Problems with using GDP as an indicator of standard of living include that:

- it does not consider income distribution;
- it ignores non-market transactions (such as unpaid care work and housework);
- it does not distinguish between 'good' and 'bad' growth – for example, it does not distinguish between growth which depletes fossil fuel reserves and growth which does not;
- it includes price inflation, which does not contribute to the real standard of living
- it does not allow for the depreciation of physical capital, hence it implies that the depletion of natural capital contributes to economic growth.

In order to take account of some of these failings a number of alternatives to GDP measures were considered. These included using a Green GDP measure (see Hamilton, 1994), or Environmental Satellite Accounts (such as those now included alongside the UK economic accounts – see ONS, 2005, Chapter 13), or an Index of Sustainable Economic Welfare ISEW/ Genuine Progress Indicator GPI (see Neumayer, 2000). Each of these seeks to broaden the scope to include aspects of standard of living not included in GDP.

The main reason for rejecting these alternative measures of a countries standard of living was twofold. Firstly, it was apparent that using them would lead to double counting with the environmental and social indicators also being developed as part of this project (see Marsden, 2005 and Lucas and Brooks, 2005). Secondly, by combining GDP with the other indicators into an aggregate indicator (as some of these alternative measures do) this could

hide the real changes that were happening in the economy so reducing the transparency of the indicator.

It was proposed instead to address the highlighted problems with GDP within the sustainable indicator framework in three ways:

1. by placing the standard of living indicator alongside indicators of environmental and social sustainability, which include indicators considering equity and natural resource use among them (environment indicators discussed in Marsden (2005) and social indicators discussed in Lucas and Brooks (2005));
2. by using real GDP rather than nominal GDP, stripping-out the effect of price inflation;
3. by taking an adjusted measure of GDP more relevant to the individual level of standard of living, i.e. real GDP per capita.

Applying this indicator to the economy constraint derived from the Brundtland Commission, we find that real GDP per capita meets the economy constraint (standard of living) in the sustainable appraisal framework if it is at least maintained at the current level or is increasing over time.

Possible economy indicators other than those relating to GDP were considered and rejected by the study. Although indicators such as 'Total investment as a % of GDP' and 'Employment / Unemployment as % of population of working age' address aspects of the economy which are considered important in some sustainable development frameworks, the case for their inclusion here was undermined by the need to apply them to transport projects and policies, rather than to monitoring the national economy over time (as in the National Accounts). For projects/policies it has proved difficult, scientifically, to predict net investment and employment effects of transport changes, so that estimates on these indicators would lack reliability and hence credibility. Of course, estimating GDP impacts is also non-trivial, however there are methods existing and under development with which estimates of the GDP impact can be made. These are discussed in the following Section.

3 Measuring the impact of transport on real GDP per capita

Having identified real GDP per capita as the 'high-level' indicator of standard of living it was then important to identify how the impact of transport projects and policies on this indicator could be measured. The potential approaches range from those currently being developed to those currently available for use:

- The first approach that could be adopted to measure these impacts is to model explicitly the linkages between transport changes and the wider economy (see, for example, Oosterhaven and Elhorst, 2003, Bröcker *et al,* 2004 and Venables, 2004). The main barrier to implementing this approach for projects and policies is that the methods and models are at an experimental stage in their development. Although we think it is very likely that there will be scientific advances in this area, the current state of the art will not support this approach for most projects/plans and instead a proxy for GDP change is needed. Cases in which it *may* be feasible to use development versions of transport-economy models to investigate GDP impacts directly include mega-projects such as CrossRail in London where the research costs seem commensurate with the scale of investment. Oosterhaven's work concerned a new High Speed line in the Netherlands – another possible application.
- For most applications in the short term – including road and rail based projects, and integrated transport packages and policies – the most realistic proxy is the cost- benefit method currently used in transport appraisal, which forms part of WebTAG (DfT, 2005). Since this part of WebTAG was originally designed to serve the purpose of a welfare analysis, rather than a GDP indicator, care is needed when applying it in this context. This issue is considered when we examine the indicator in greater detail (Section 4).

We have characterised these two methods as the *long term aspiration* (direct modelling of GDP using multi-sectoral models) and the *short term proxy* (net benefits measured in the transport sector using WebTAG methods).

4 Discussion of selected indicator

4.1 Proposed indicator

Table 1 below shows the indicator of standard of living (real GDP per capita), the methods that were proposed to measure the effect of transport on this indicator and the direction of change that is consistent with sustainability. This first draft economy indicator was presented and discussed with a range of external stakeholders during 2005, as part of the wider set of sustainability indicators developed in this project (Marsden *et al,* 2005b). The rest of this section examines the proposed indicator in more detail, including: the 'strength' of the proposed indicator; dynamic issues; the disaggregations of the indicator which may be necessary in practice (also shown in Table 1); the sustainability constraint in terms of this indicator; and, briefly, data sources to support the indicator.

The following Sections 5 and 6 address the results of the stakeholder consultation.

Table 1 Indicators presented to key stakeholders

Area of Progress	Indicator of Progress	Disaggregation of net benefits	Direction of change
Standard of Living	Real GDP per capita based on: • *In the short term* – proxied by net benefits measured in the transport sector using WebTAG methods • *Long term aspiration* - direct modelling of GDP using multi-sectoral models	• Business User Benefits • Consumer User Benefits • Reliability • Safety • Operator Gains • Public Finance Balance	Increasing (strictly non-decreasing)

4.2 Strength of indicator

The strength of this indicator is tied up with:

- the ability of cost-benefit analysis to fully capture the economic benefit from a transport project or policy;
- the ability of experimental transport-economy models to reliably predict the same benefit.

It is a standard result in economics (e.g. Dodgson, 1973) that in a *perfectly competitive* economy a CBA would capture all the impacts of a transport change to GDP. In the real world economy, studies such as the recent one by Bröcker *et al* (2004) have asked whether this result holds and have concluded that CBA is a suitable approximation for GDP change provided that the changes in the transport system are not dramatic: "*For ceteris-paribus policies current transport CBA practice would be sufficient i.e. calculating the direct transport effects in terms of volume, cost and time changes with a transport network model. Based on these consumer and producer surplus provide the base for assessment, that is accompanied by a consideration of environmental impacts, accidents and investments by the policy".* However, as the economy is not perfectly competitive it has been argued that using CBA to measure the economic growth from transport investment will not take into account all the effects. For example, Venables (2004) identified that there may be additional agglomeration benefits resulting from transport improvements that essentially increased a city's production capacity due to the size and quality of the accessible workforce. These types of effects are not accounted for in a traditional cost-benefit analysis, and their empirical significance is not yet confidently understood. Estimates of the size of additional benefits ranges from +3% (Newbery, 1998) to +83% (Oosterhaven and Elhorst, 2003), and in the negative direction to -15% (a different project examined by Oosterhaven and Elhorst, 2003). To caricature the

situation, we have on offer one method which is well established and reliable in terms of its *process*[1], but may give biased results for certain types of projects. We have another, experimental approach which may be unbiased but whose reliability is not yet known.

In this situation, we conclude that the cost-benefit indicator of net benefits is not perfect, but it is the best indicator of the effects at a project/plan level that is currently available – provided that it is used with regard to its known limitations. It is proposed for the sustainability appraisal framework that net benefits should be implemented as the proxy indicator in the short- to medium-term. The transport-economy modelling approach remains an attractive prospect in the longer term.

4.3 Dynamic issues

Having identified a method for practical use, we need to recognise two key issues in applying this at the project/plan level. Both relate to the way in which sustainability indicators will be used, *as distinct from* the way in which cost-benefit results are traditionally used.

Marsden *et al* (2005) state that the focus of the sustainability appraisal is on pinpointing the levels of the economy, social and environmental indicators at a specific point in the future – the 'sustainability assessment year' – and comparing these levels with either the current year (is the indicator moving in the intended direction of change?) or with a policy target (is the indicator meeting or breaching the policy target?). This is different to the way that cost benefit analysis is usually applied (for example, using the WebTAG procedures (DfT, 2005)), whereby costs and benefits are usually calculated over the whole appraisal period up to a horizon year, then discounted back to the present day and *summed* to give a net present value (NPV) for the project or policy. Given this difference in focus, it will be necessary in the sustainability appraisal to report the net economic benefit, undiscounted, in the particular 'sustainability assessment year'.[2]

This raises two related issues. Firstly, the dynamic impact of 'lumpy' investment costs must be considered carefully when the appraisal is focused on just one year. For example, what is the impact of a one-off cost incurred in Year y_1 in a subsequent appraisal year y_2? Whilst the annual benefit from the investment is usually forecast across the appraisal period, the *annual* impact of an earlier investment cost is not usually modelled.

Secondly, it is in the nature of any investment (and some although not all transport projects/policies involve investment) that benefits/consumption are sacrificed in the short term in order to secure a positive return on the investment which will yield greater benefits/consumption, albeit at a later date. It is conceivable that the year-on-year net benefit brought about by such a project in the short term will be negative, creating a conflict with the 'direction of change' criterion for sustainability, whilst in the long term the net benefit would usually, if the investment was motivated by economic factors, be positive. Both of these issues must be addressed by a workable economic sustainability indicator: we set out our proposed approach below.

As to how to account for 'lumpy' investment costs and possible violations of the sustainability constraint in the short term, two options were proposed. The latter of these two was given more prominence in the interviews with stakeholders:

1. One is to make use of the existing calculations. We could suppose that the Present Value of the investment cost is spread equally over the lives of the assets, giving an annual cost and hence an annual *net* benefit. This of course rests on the assumption that the impact on GDP would be spread in this way over time. Whether this is true would depend on the method of financing, and on any dynamic effects on the

[1] for example, a third party could verify the input data, assumptions and results.

[2] a comparative analysis of both the existing NPV and the proposed approach will be an important stage in understanding the potential implications the change in approach.

economy. In the current state of knowledge these dynamic effects are too difficult to predict with any degree of confidence. Therefore we must rely on the intuitive appeal of this assumption. Two of our consultees noted that it seemed broadly consistent with current project/policy appraisal approaches, which they considered to be in its favour.

2. Alternatively, we may wish to adopt an *amortization* approach, that is to allocate the initial investment expenditure to the remainder of the asset life in the form of an annual charge for servicing the 'debt' created by the initial investment. If the debt is to be paid from public capital budgets, the appropriate interest charge might be based on a public sector cost of capital – although this might be higher than the 3.5% social discount rate adopted in WebTAG (DfT, 2005).

   The formula for amortization is:

$$c = C\left(\frac{1-(1+r)}{1-(1+r)^{N}} + r\right)$$

   where *c* is the equivalent annual charge;
   C is the investment cost being amortized;
   r is the interest rate; and
   N is the number of years over which the cost is being amortized.

   It is usual to assume a flat profile of amortised costs, therefore:

   Total costs over asset life / Asset life = Amortized costs per year

   If the investment cost is amortized in this way from the opening year of the project to the terminal year of the assets' lives, we have an annual measure of the net economic benefit, based on:

   - the flow of economic benefits in that year;
   - a notional charge against the capital costs of the investment.

   The balance between these two amounts to a proxy to the net annual GDP impact.

Amortization of costs as described above is a standard practice in infrastructure financing. Note, however, that in a reversal of the effects of the usual appraisal practice of discounting, amortization would have the effect of increasing the burden of capital costs in the appraisal. Thus capital intensive projects – including infrastructure investments on all modes – would be likely to perform less well under Option 2 than under Option 1 above, compared with other types of projects and policies.

Under Option 2, it would be possible for net benefits in some years to be negative, in violation of the sustainability requirements. One response to this would be to abandon Option 2 as impractical. However, another response would be to indicate to appraisers that economic sustainability should be measured over a time period appropriate to the project/policy under scrutiny. Therefore a package of low-cost management measures which is expected to bring immediate net benefits might be appraised after 1 year or 5 years; whilst for a new rail station it may be more appropriate to set the 'sustainability appraisal year' 15 or 25 years in the future.

The uncertainties over the true time profile of costs and any dynamic effects remain unresolved and might be suitable topics for further research. For the moment, in summary we propose two potential methods for handling lumpy investment costs:

- Allocation of the Present Value of Costs uniformly across the appraisal period;
- Amortization of the costs.

The next section discusses in more detail the disaggregation of the net benefit indicator which will be necessary in practice.

4.4 Disaggregation

Net benefits as measured by WebTAG (DfT, 2005) are an aggregate of a number of parts, which are:

- Business User Benefits
- Consumer User Benefits
- Safety
- Reliability
- Operator Gains
- Public Finance Balance

There are specified methods for calculating each part of net benefits. The relevant sections of WebTAG (DfT, 2005) are noted under each part below.

Business User Benefits

This measure calculates the change in user benefits to business users from the introduction of a project/plan. Business users include business travellers on their employer's business, self-employed business travellers, freight transport, and intermediate groups such as travelling salespeople. User benefits to these groups are calculated from changes in travel times, user costs and vehicle operating costs. The sustainability appraisal would compare the total net benefits in the sustainability appraisal year with the total net benefits in the current year, of which business user benefits are a part. The methodology for calculating the business user benefits can be found in: *TAG Unit 3.5.3 – Transport User Benefits Calculation* (DfT, 2005).

Consumer User Benefits

This category includes commuter travel and other consumer trip purposes – including leisure (holiday travel, etc) and shopping. Although arguments have sometimes been made that these benefits do not contribute to GDP because consumers are not paid for the time they allocate to these trips, it is worth noting that consumers do pay for fares, fuel and other private vehicle operating costs for these trips – they are part of the money economy and the demand for travel. Furthermore, the benefits of improved commuter travel may be felt financially by the businesses for which the commuters work – the nature of this relationship is the subject of the work by Venables (2004) and others. For the moment, it does not seem outlandish to suggest that at least part of these benefits feed through into GDP. We retain consumer user benefits in our measure of net benefit. Methodology for calculating the consumer user benefits can also be found in: TAG Unit 3.5.3 – Transport User Benefits Calculation (DfT, 2005). Future research findings should help to refine this aspect of the appraisal.

Safety

The aspect of safety that is included in net benefits is related to accidents. It accounts for the fact that accidents impose a range of impacts on people and organisations including:

- medical and healthcare costs;
- lost economic output;
- pain, grief and suffering;
- material damage;
- police and fire service costs;

- insurance administration;
- legal and court costs.

The WebTAG method calculates the number of accidents resulting from the scheme/plan (compared in the sustainability appraisal to the current year) and combines this with the values for the prevention of casualties and accidents and this determines the monetary estimate of the accident benefits of the proposals. The methodology for calculating the safety costs can be found in*: TAG Unit 3.4.1 - The Accidents Sub-Objective* (DfT, 2005).

It may be appropriate to omit the cost element for pain, grief and suffering from the sustainability appraisal. Whilst the other elements of accident costs relate to monetary costs, the pain, grief and suffering cost element is based purely on willingness to pay – it could be argued that there is no counterpart in actual payment, and the GDP-related effects of accidents and casualties are measured in terms of lost economic output and other cost items. As noted in Section 5 below, several stakeholders noted that safety is sufficiently important to justify an indicator of its own within the Framework, although probably not within Economy – given this, it seems particularly unnecessary to extend the treatment of safety costs beyond the clearly monetary costs within the GDP/net benefit indicator.

Reliability

Although reliability is often addressed using non-monetary measures (e.g. a stress-based method for roads), it remains an option for appraisers to estimate the reliability benefits of projects and plans in terms of money benefits. These can be thought of as an extension of the business and consumer user benefits above. A good example of this approach to the inclusion of reliability benefits in appraisal is given by the SRA's 'Appraisal Criteria' guidance (2003).

Operator Gains

Operator gains, whether through increases in revenue or decreases in costs, are also included in the net benefit measure in WebTAG (see TAG Unit 3.5.2 - The Transport Economic Efficiency Sub-Objective). Changes in fuel costs and non fuel costs (e.g. oil, tyres, maintenance, depreciation and vehicle capital saving) for road transport service operators can be estimated using the formulae given in TAG Unit 3.5.6 (DfT, 2005).

Public Accounts Balance

Finally, the impact on the public accounts also forms part of the of the overall net benefit – this is defined in TAG Unit 3.5.1 (DfT, 2005). One modification here will be the possible amortization – rather than discounting – of public investment (Section 4.3).

All the above elements are brought together in an assessment of net benefit for the sustainability appraisal year. Any investment costs incurred by private or public sector providers should be amortized as described in Section 4.3.

4.5 Direction of change

The sustainability constraint for the economy is that the standard of living should be non-decreasing (Section 2). The desired direction of change in the economy indicator – real GDP per capita – is therefore upward, or at least there should be no reductions year-on-year. At the level of an individual project or policy, we could say that to be consistent with the desired direction of change overall, the project or policy should therefore have a non-negative impact on the economy indicator. In terms of the proxy indicator, net benefits, this is equivalent to saying that there should be non-negative benefits each year.

We noted in Section 4.3 that investment projects may create negative net benefits in the short term. Careful choice of the sustainability assessment year will therefore be required when dealing with investment projects, depending upon the approach taken to amortization (see Section 4.3).

4.6 Data sources

The data required to carry out an assessment of the net benefit in any specified sustainability assessment year will not differ significantly from the data required to conduct an ordinary cost-benefit analysis within the rules of WebTag (2005). Note, however, that forecasts of key variables will be required for the sustainability assessment year. The trajectory of net benefits between the current year, the sustainability assessment year and beyond, will require the use of interpolation and extrapolation (see TAG Unit 3.5.4, DfT, 2005).

5 Stakeholder views

Generally stakeholders were supportive of the proposed economy indicator. Some specific comments made were the following, which we report in summary form. We return to address these comments below.

i. Welfare analysis is not directly equivalent to GDP analysis.

ii. Reliability has a greater impact on GDP than time savings.

iii. Safety indicators are important enough to have their own indicator. This would not be inconsistent with retaining then in GDP provided that only the financial impacts are retained in GDP not pain grief and suffering.

iv. Having safety indicators in the social and economic pillars could be a source of double counting.

v. Including time savings (user benefits) in the indicator is double counting with the social accessibility indicators

vi. Time savings currently have an emphasis on motorised vehicles – is this consistent with a sustainability appraisal?

vii. In the decision maker's eyes economic benefits are often more important than environmental and social benefits. How will they be presented to make sure that each is treated with equal importance?

viii. Is there a case for both a GDP indicator and a suite of other economy indicators addressing productivity, competitiveness and the spatial dimension?

ix. At what scale could this appraisal be applied and how can you deal with boundary effects?

x. What role do different sorts of towns play (e.g. market town vs. major city) and therefore what are their needs (economic, transport)?

xi. Is amortising costs a suitable method for dealing with investment costs into the future?

5.1 Responses to stakeholder views

Comment (i) is well taken. The net benefit (welfare) indicator has been put forward as a practical proxy which can measured, not as a perfect replacement for a GDP change indicator. Issues around this were discussed in Section 4.1. Our argument is that net benefit is the best feasible indicator – we have indicated our enthusiasm for further development of GDP change indicators.

(ii): The importance of reliability improvements for all transport, and especially for freight and business travel, is reflected in the relatively high values for late time included in SRA (2003), for example. There are weaknesses in appraisal methods for reliability, particularly for private transport, which DfT has been tackling through a programme of research over a number of years. However, there is considerable scope to adopt reliability valuation for public transport – including in sustainability appraisals.

The issue of safety was raised by a number of participants who felt that either there should just be one safety indicator on its own or that there were problems with double counting as the indicator was both in the social and economy pillars (iii and iv). After discussing this issue with stakeholders it was decided that safety or more accurately accidents should remain in both pillars, however the current economy measure of accidents (TAG Unit 3.4.1) would be modified to only include the monetary costs of accidents and not pain, grief and suffering.

Another issue raised, (v), was that by including time savings in the user benefit element of the proxy economy indicator, there might be double counting with the accessibility indicator in the social pillar (see Lucas and Brooks, 2005). Note, however, that the accessibility indicator gives significantly different information: it gives weighted average journey times to specific locations (schools, hospitals, employment centres, food shops), also disaggregated by car/public transport, whereas the economy indicator gives an aggregate measure of net economic benefit. The measurement of accessibility in this context relates to minimum acceptable thresholds and the relative levels of accessibility for different user groups and, although using interconnected data, provides different information to that used in the economic pillar. In a system of three “interdependent and mutually reinforcing” pillars, it is difficult to eliminate the potential for double counting entirely. In this case, the aim is to provide the best indicators we can for each pillar, and to avoid outright duplication between pillars.

(vi): It is true that non-motorized transport is sometimes overlooked in transport appraisals, however, the methodology for including it within the appraisal is part of WebTAG (DfT, 2005) – for example, values of time for walking and cycling are given alongside other modes in TAG Unit 3.5.6 (DfT, 2005). Additional advice for local authorities to ease the process of completing the appraisal for walking and cycling projects is being prepared and is expected to be released soon by DfT within WebTAG (DfT, 2005). In response to this comment, we should emphasise that the proposed economy indicator does include walking and cycling, and practicability issues which may have been experienced by some appraisers in the past should be alleviated by the forthcoming DfT advice.

(vii): The framework report (Marsden *et al,* 2005a) shows how the indicators will be presented. Note that Economy will be presented on a par with Environment or Society. The single economy indicator will not visually dominate the assessment table. By focusing the economy indicator on GDP rather than welfare, it is hoped to avoid the tendency for it to become all-encompassing, at least in decision-makers’ eyes.

(viii): A consultee thought that the single indicator has the merit of some degree of consistency with the goal pursued by other non-transport policies, but that it lacks explicit resonance with some other Government economic goals – e.g. the Treasury emphasis on promoting productivity, or the spatial dimension to economic progress (PSA targets to enable all UK regions to maximize their economic potential and to reduce the economic disparity between regions). We accept this comment. It was acknowledged above that other economy government objectives for economic development exist (Section 2.2). The reason for not implementing all of these is purely one of feasibility and lack of suitable analytical techniques.

The ongoing DfT study led by Rod Eddington may help to point the way towards the necessary scientific advances. This at least applies to productivity and competition effects. The spatial dimension could be addressed by applying the real GDP per capita indicator at a regional level. However, without transport-economy models, it will be difficult to gain confidence that the net benefits of transport changes accrue in the same locations as the projects themselves.

(ix): The question of the scale at which the method could be applied (local, regional, national) is one which will be tested through case studies in Stage 2 of the work. The method has been developed with local, regional and national applications in mind. Boundary effects will sometimes be an issue, e.g. transport improvements in one locality may encourage economic growth in an adjoining locality. At the same time, by choosing an appropriate scale for the analysis, boundary effects of particular projects or policies may be minimised.

Comment (x) is an interesting question, the answer to which lies beyond this project – although we do intend to draw conclusions about sustainability for case study towns/cities.

Finally, (xi) recalls the difference between amortization and discounting, and the policy implication that switching to amortization would probably weaken the case for major investment projects (Section 4.3). The option of allocating the discounted net benefit uniformly across the project's economic life, was suggested as an alternative if amortization proved unacceptable.

6 Recommended Revisions

The revised economy indicator is described in Table 2.

Table 2 Economy Indicator

Area of Progress	Indicator of Progress	Disaggregation	Direction of change
Standard of Living	Real GDP per capita based on: • *In the short term* – proxied by net benefits measured in the transport sector using WebTAG methods • *Long term aspiration* - direct modelling of GDP using multi-sectoral models	• Business User Benefits • Consumer User Benefits • Reliability • Safety (monetary costs only) • Operator Gains • Public Finance Balance (modified by amortisation of investment costs)	Increasing (strictly non-decreasing)

7 Conclusions

This report has considered the options for a sustainability indicator relating to the economy, within a three pillared sustainable development framework (Marsden *et al*, 2005a). The preferred indicator is real GDP per capita. Due to the difficulties implementing this for transport projects and policies, a proxy has been recommended for use, pending developments in transport-economy modelling: the proxy indicator is the net economic benefit measured using WebTAG cost-benefit methods (DfT, 2005), although with a small number revisions to ensure the focus is on the economy.

Detailed implementation issues were considered, and it was suggested that amortization of investment costs might be needed in order to capture the net benefit at a specific point in time: important for an appraisal in a given 'sustainability assessment year'.

Stakeholders' comments were invited and considered (Section 5) – these led to some revisions to the indicator, and raised issues for investigation at the next stage of the work.

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