Appraisal of Sustainability

A Framework for the Appraisal of Sustainability in Transport

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Executive Summary

This report describes the first stage of a project seeking to develop an improved methodology for capturing and assessing the sustainability of decisions about, or decisions that impact on, the transport system. The report sets out why a new approach to assessing sustainability is necessary, how it might work and why it differs from current procedures. The approach could help to fulfil one of the commitments from the 2004 Transport White Paper

> "…an important underlying objective of our strategy is balancing the need to travel with the need to improve quality of life. This means seeking solutions that meet long-term economic, social and environmental goals. Achieving this objective will clearly contribute to the objectives of the UK sustainable development strategy….***we will ensure that the wider impacts of future developments are reflected in appropriate appraisal methodologies***."
>
> (The Future of Transport, White Paper, Department for Transport, 2004, p14, emphasis added)

A key aspect of providing information to support policy relevant sustainable development decision-making is the need to understand fully the position and direction of change of indicators relative to a current or forecast future benchmark position. This requires a different approach to that typically adopted in transport appraisal where a scheme or strategy (represented by the grey dot at the assessment year in the diagram below) is compared with a hypothetical 'do-minimum' scenario as shown in Figure A.

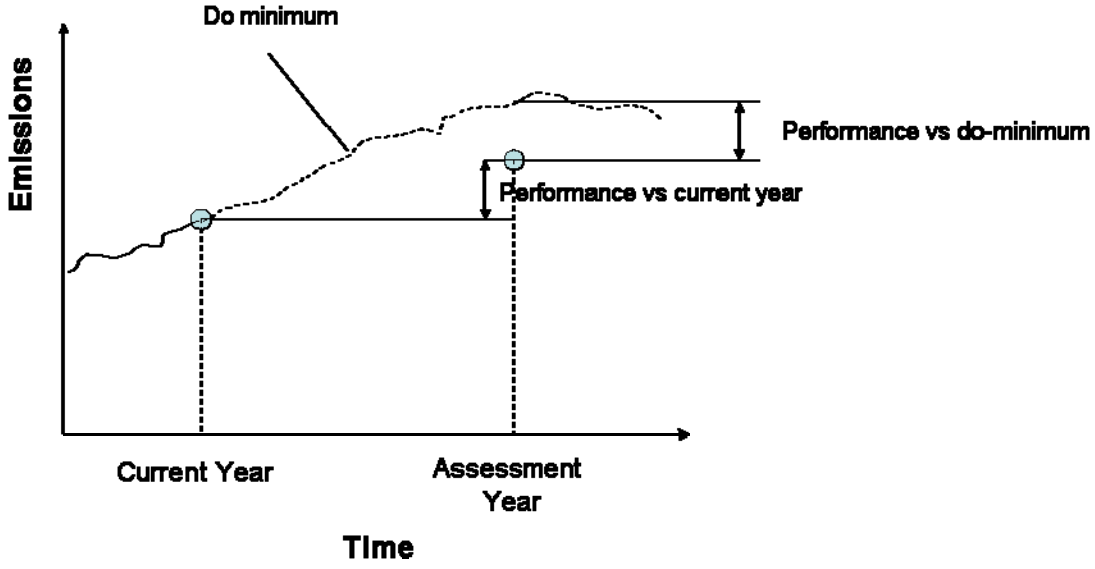

Figure A: Do-minimum and intervention assessment

We have examined the principles of sustainability and the lists of indicators in use in transport and planning today. Through an evidence-led process of

elimination we have produced a suite of 17 indicators that we believe cover the full range of sustainability concerns cutting across transport and land-use planning. We have also developed an appraisal framework within which decisions on the relative sustainability of different policy options can be made. We believe that the approach is comprehensive but also light-touch and could (should!) be applied at scheme and strategy design level rather than simply being seen as a hurdle to be leapt.

It would perhaps be seen as a retrograde step if all we were to propose was one further level of appraisal burden on the transport profession. However, we believe that the approach proposed can work with, refine and replace parts of the existing process. The approach could immediately be adopted as part of the SEA requirement assessment process for Regional Spatial Strategies and Local Transport Plan assessment.

Table A: Appraisal Procedures and Scope for framework application

Strategy Level	Assessment Procedure				
	NATA	LTP	SEA	ODPM SA	Framework
National Transport Policy	✓✓				Yes
Regional Spatial Strategy (Regional Transport Strategy)	✓		✓✓	✓✓	Yes
Local Transport Plan	✓	✓	✓✓		Yes

✓✓ Requirement
✓ Influences

In addition to the difference in approach to the use of indicators described above, there are two key areas of difference between the NATA indicators and those put forward within this project:

1. The sustainability framework covers the efficiency of environmental resource use which is not reflected in NATA which is a common goal across proponents of both weak and strong sustainability approaches.
2. The coverage of social issues is far more comprehensive within the framework than is currently the case within NATA. These indicators are only meaningful when used as direct measures of change (rather than comparators with do-minimum figures).

The final stage of this is to test the framework using existing models and data sets. The aims of the tests are to:

1. Determine which indicators are practical to forecast with current techniques
2. Compare several transport strategy options using the appraisal framework
3. Consult stakeholders about the usefulness and applicability of the results
4. Identify gaps in our capabilities to assess the sustainability of transport

This work will be undertaken in late 2005, early 2006

Contents

1 Introduction

1.1 Definition of sustainability

Sustainability or Sustainable development has been commonly defined 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" (WCED, 1987). This definition brought together what is now known as the three pillars of sustainable development; economic development, social development and ecological development under one societal goal of sustainability.

The UK Government in its 1999 Sustainable Development Strategy set out four central aims:

- social progress which recognises the needs of everyone;
- effective protection of the environment;
- prudent use of natural resources; and
- maintenance of high and stable levels of economic growth and employment.

The new 2005 strategy recognised that "although the 1999 strategy stressed that these objectives had to be pursued at the same time, in practice, different agencies focused on those one or two most relevant to the,. So a new purpose is needed to show how government will integrate these aims and evolve sustainable development policy" (DEFRA, 2005, p15). The revised principles are:

- "Living within environmental limits
- Ensuring a strong, healthy and just society
- Achieving a sustainable economy (*Ibid*., p16)

Principles of good governance and the responsible use of sound science are also put forward.

1.2 The rationale for a sustainability appraisal

As can be evidenced from the policy documents described above, there is great concern about the long-term 'sustainability' of the transport sector both nationally and globally. Non-renewable resource use, climate change and habitat destruction are at the forefront of environmental concerns. The tension between transport investment to improve economic growth and standard of living on the one hand and subsequent environmental degradation on the other has been at the forefront of debate for at least the past 20 years (Banister, 2002). Increasingly social sustainability, and the degree to which transport

interventions permit the development of new social structures and behaviours, or destroy, damage or impair the continuity of existing ones, is at the forefront of the policy debate (SEU (2003) Lucas (2004)).

This project has charted the development of the concept of sustainability and how it has been applied to transport in particular (Kelly, 2005). The predominant approach to assessing the sustainability of transport interventions is through post-hoc monitoring of a series of indicators (e.g. DEFRA, 2005). Many attempts have been made to refine and improve such indicator sets (Jeon and Amekudzi, 2005). Whilst there is merit in further work to understand and operationalise definitions of sustainability this work sought first to understand how the key sustainability concepts were being used in transport. Gudmundsson (2003) concluded in a review of the sustainability of national transport policies that "Even a perfect indicator system for sustainable mobility may be of little relevance if it has no bearing on actual decisions taken".

Finally, by way of introduction, there is an identified policy need to push forward work in this area. The 2004 UK Transport White Paper stated how it would like to see sustainability treated:

> "…an important underlying objective of our strategy is balancing the need to travel with the need to improve quality of life. This means seeking solutions that meet long-term economic, social and environmental goals. Achieving this objective will clearly contribute to the objectives of the UK sustainable development strategy….***we will ensure that the wider impacts of future developments are reflected in appropriate appraisal methodologies***."
>
> (The Future of Transport, White Paper, Department for Transport, 2004, p14, emphasis added)

This document sets out, in summary, the arguments for a modified approach to appraisal within the transport sector that would more fully incorporate sustainability into the decision-making process for strategy and scheme development. Chapter 2 reviews the existing appraisal mechanisms and sets out a new framework approach. Chapter 3 presents the key aspects of sustainability that should be incorporated in such a framework and discusses how this can be put into practice. Chapter 4 provides some conclusions and suggests some issues that require further testing. The report concludes Stage one of a two stage process – in the second stage the framework will be applied and the indicators developed further and tested. The report has been compiled following discussions with a range of stakeholders about the framework put forward:

- Department for Transport
- Department of Environment, Transport and the Regions
- Office of the Deputy Prime Minister
- HM Treasury

- Sustainable Development Commission
- Transport 2000
- Friends of the Earth
- Campaign to Protect Rural England
- Yorkshire Forward
- Yorkshire and Humber Assembly
- Government Office for Yorkshire and Humber
- Passenger Transport Executive Group
- Environment Agency
- Confederation of British Industry

We are grateful for the time and feedback provided by these stakeholders.

2 Appraisal in Transport

2.1 National Definitions

The Treasury Green Book states that appraisals should:

> "provide an assessment of whether a proposal is worthwhile, and clearly communicate conclusions and recommendations"

This is further interpreted by the Department for Transport to suggest that:

> "Appraisal is the process of checking that value for money is achieved in delivering Government aims" (DfT, 2005)

An appraisal therefore should provide an assessment of the extent to which a Government intervention (policy, project or package of projects) is achieving the aims of Government and also some measure of whether the intervention is worthwhile.

2.2 Appraisal in Transport

Appraisal of transport policies and projects exists at two main levels in England. Transport policies and programmes such as Local Transport Plans are developed in accordance with Department for Transport guidance, including monitoring and evaluation criteria (DfT, 2004). Such policies and programmes are also required to be subject to a Strategic Environmental Assessment (Ferrary and Crowther, 2005). Major schemes (individual projects costing over £5 million) are required to go through an individual project appraisal. Both processes are conducted under the principles of the New Approach to Appraisal (NATA) framework (DfT, 2005).

2.2.1 Major Scheme Appraisal

NATA represents a significant change from the traditional Cost-Benefit Analysis (CBA) approach to assessing the total costs and benefits from a project. CBA concentrated on certain monetised costs and benefits: in particular, quantifiable user benefits, implementation and operating costs and external environmental and safety costs. NATA assesses impacts in five overarching objectives of Economy, Environment, Safety, Accessibility and Integration and in so doing includes but expands on the CBA approach. It also further divides the five objectives into sub-objectives (e.g. under environment it considers noise, air pollution, landscape, townscape, biodiversity, heritage, water and greenhouse gases – see Table 1).

Table 1: NATA Objectives and sub-objectives

NATA Objective	NATA Sub-Objective
Environment	Noise
	Local air quality
	Greenhouse Gases
	Landscape*
	Townscape*
	Heritage*
	Biodiversity*
	Water environment*
	Physical fitness
Safety	Accidents
	Security
Accessibility	Community severance
	Access to the transport system
Economy	Public accounts
	Business users and providers
	Consumer Users
Integration	Transport interchange
	Land-use policy
	Other government policies

The fundamental approach to the application of the appraisal has remained unchanged since its introduction. It involves the comparison of a project or series of policy interventions against a baseline or 'do-minimum' scenario. The results that are presented are relative to that baseline scenario with the exception of the environmental impacts marked with an asterisk on the chart which are relative to current conditions. Typically, the baseline scenario is based on National Road Traffic Forecasts (assuming continuation of current policy) and – at a local level – the implementation of current committed projects (often referred to as a 'do-minimum' scenario).

2.2.2 Local Transport Plans

Local Transport Plans (LTPs) are five year transport strategy documents required for all areas in England outside London. The first five year documents for 2001/02 to 2005/06 were bids for capital funds to complete the strategy. Awards were made on the basis of vision and compatibility with the aims of the 1998 Transport White Paper. The submissions were not structured to demonstrate a comprehensive coverage of sustainability issues although many such issues were indeed covered. LTPs were to include indicators and targets determined locally. Some submissions had up to 100 such indicators but many were related to what would be built rather than what the resultant transport and environmental outcomes would be.

The second round of LTPs is different in nature. Funding is allocated on a formulaic basis according to agreed criteria that relate to the problems faced by an area. The LTPs will be assessed on their performance against the following three areas (DfT, 2005):

1. Quality of planning
    - Context
    - Analysis
    - Maximising value for resources
    - Performance management
    - Priorities
2. Impact of LTP targets
    - Satisfaction with ambition of targets
    - Achievement of targets over time
3. Deliverability

The central theme of the LTP submissions is based around the list of shared priorities agreed with the local authorities:

- Road Safety
- Accessibility
- Congestion
- Air Quality

Local authorities are required to report on 17 key indicators and are able to select others locally. The key indicators are:

1. BVPI96 Principal Road Condition
2. BVPI97a Non-principal Classified Road Condition
3. BVPI97b Unclassified Road Condition
4. BVPI99 (x) Total killed and seriously injured casualties
5. BVPI99 (y) Chilled killed and seriously injured casualties
6. BVPI99 (z) Total slight casualties
7. BVPI102 Public transport patronage
8. BVPI104 Bus satisfaction
9. BVP187 Footway condition
10. An accessibility target
11. Change in area wide road traffic mileage
12. Cycling trips (annualised index)
13. Mode share of journeys to school
14. A bus punctuality indicator
15. Changes in peak period traffic flows to urban centres
16. Congestion (vehicle delay)
17. An air quality target

The list of indicators above is somewhat different to those typically put forward by researchers considering a comprehensive assessment of sustainability (Litman, 2003). Whilst it is possible that the gaps in the list

above might be filled by voluntary indicators there are two principal factors that argue against this being likely:

- Funding settlements will be related to performance against targets set for each of the indicators. Progress is likely to be reported annually which makes selecting indicators which will only exhibit change in the longer term (which is consistent with sustainability aims) less appealing.
- There will be a different approach adopted by each authority making a standardised approach to considering these issues difficult to foresee.

2.2.3 Strategic Environmental Assessment

The requirements of European Directive 2001/42/EC (also known as the Strategic Environmental Assessment (SEA) Directive) mandate the consideration of environmental issues as an integrated part of the planning process for all plans and programmes (including Local Transport Plans). The aim of Strategic Environmental Assessment is "to provide a high level of protection of the environment and to contribute to the integration of environmental considerations into the preparation and adoption of plans with a view to promoting sustainable development" (Article 1, SEA Directive).

An SEA should cover issues such as biodiversity, population, human health, fauna, flora, soil, water, air, climatic change, material assets and cultural heritage. An SEA should include secondary, cumulative, synergistic, short, medium and long-term permanent and temporary, positive and negative effects.

Much of the process required by the SEA Directive already existed within NATA. However, enhancements to NATA "requires additional work on:

- collecting baseline environmental information and identifying environmental problems;
- predicting the significant environmental effects of the plan;
- identifying mitigation;
- identifying alternatives and their effects;
- consulting the public and authorities with environmental responsibilities;
- reporting how the results of the SEA and consultation responses have been taken into account;
- providing a non-technical summary of the SEA; and
- monitoring the actual environmental effects of the plan during its implementation." (DfT, 2005, TAG Unit 2.11)

A comparison of the SEA topics and NATA objectives is shown in Table 2.

The SEA process therefore provides enhanced consideration of environmental issues and their mitigation during the appraisal process. It does not however

ensure that the sustainability of proposals is assessed, simply the environmental consequences.

Table 2: Comparison of NATA objectives and SEA topics

NATA Objective	NATA Sub-Objective	SEA topic (SEA Directive, Annex If)
Environment	Noise	Human health, population[1], inter-relationships
	Local air quality	Air, human health, population
	Greenhouse Gases	Climatic factors
	Landscape*	Landscape
	Townscape*	
	Heritage*	Cultural heritage including architectural and archaeological heritage
	Biodiversity*	Biodiversity, fauna, flora, soil[4]
	Water environment*	Water
	Physical fitness	Human health, population
Safety	Accidents	Human health, population
	Security	
Accessibility	Community severance	Population
	Access to the transport system	
Economy	Public accounts	Material assets[5]
	Business users and providers	
	Consumer Users	
Integration	Transport interchange	n/a
	Land-use policy	
	Other government policies	

Source:: Modified from: DfT (2005) Section 3.2.6

Footnote:
1. *Population is interpreted broadly, referring to effects on people and quality of life. Many NATA indicators incorporate population.*
2. *The NATA local air quality indicator does not cover regional air quality, though guidance is given on its assessment. Where regional air quality is likely to be an issue, a local objective may be formulated.*
3. *Biodiversity also covers geological interests.*
4. *Soil is not explicitly covered by NATA sub-objectives, but is an underlying factor affecting landscape, heritage, biodiversity and the water environment. Where effects on soil are likely to be important, a local objective should be formulated.*
5. *Material assets are not explicitly covered by NATA sub-objectives, but are reflected in the money costs incurred when they are consumed. Where effects on material assets such as infrastructure, property and sterilisation of mineral or other resources are expected to be of particular importance, a local objective should be formulated.*

The integration objective is really a means to delivering the primary objectives above and as such is not considered further in the comparison of appraisal regimes. In practical terms this means that measures that involve integration of transport modes, of transport systems and land-use decisions and between transport and the health or education sectors (for example) that lead to the

achievement of improved efficiency and environment would still score positively.

2.2.4 ODPM Sustainability Appraisal

"Under the Planning and Compulsory Purchase Act 2004, Sustainability Appraisal is mandatory for Regional Spatial Strategies (RSS), Development Plan Documents (DPDs) and Supplementary Planning Documents (SPDs) (see Figure 1)." (ODPM, 2004, p9). Regional Transport Strategies, part of the Regional Spatial Strategy, are therefore subject to a sustainability appraisal.

The requirement for a Sustainability Appraisal and the guidance on their conduct encompasses the requirements of the Strategic Environmental Assessment but also widens the scope of the assessment to include social and economic considerations. The fundamental processes that are to be pursued in conducting a sustainability appraisal are:

- "collecting and presenting baseline information
- predicting the significant effects of the plan and addressing them during its preparation
- identifying reasonable plan options and their effects
- involving the public and authorities with social, environmental and economic responsibilities as part of the assessment process
- monitoring the actual effects of the plan during its implementation" (*Ibid*., p9).

There is a requirement for different options to be developed and considered by as part of a consultative process. "Each of these reasonable options, including the "do-nothing" or "business as usual" options, should be tested against the Sustainability Appraisal Framework to determine their performance in sustainability terms, with reference to the social, environmental and economic characteristics already identified for the geographical area affected by the Regional Spatial Strategy revision." (*Ibid*.,p43)

The guidance is however deliberately not prescriptive or detailed in recommending the approach to be used to determine which aspects of sustainability are to be the focus of assessment with indicators being drawn from existing strategies for the most part. A recent review of how sustainability appraisals have been applied to the Regional Transport Strategy in Yorkshire and the Humber suggested that despite the guidance, "a regional approach to sustainability, particularly with respect to transport, needs to be produced" (Ferrary and Crowther, 2005). It appears that the framework and process that is set out through planning legislation does not provide a practical route forward to assessing the sustainability of transport strategies at a regional level.

2.3 *The case for an appraisal of sustainability in transport*

2.3.1 Measuring sustainability

The Government's definition of sustainability, like many others, sets out a series of principles that can be used to assess 'social progress'. These include factors such as a strong economy, equal opportunities and respect for environmental limits. The process adopted within the Sustainable Development strategy is to identify indicators that can be used to assess, over time, whether trends are heading in the right direction.

2.3.2 Comparison with transport appraisal

An indicator-led approach can be contrasted with that adopted in transport appraisal. In the NATA approach, the information given to the decision maker reflects the impact of an intervention compared with a 'do-minimum' or 'do-nothing' scenario. There is no guarantee that a course charted by a 'do-minimum' approach would lead to a sustainable outcome and, therefore, there can be no guarantee that any intervention compared to this 'do-minimum' would be sustainable either. This concept is demonstrated below in Figure 1 with a hypothetical example of a measure of emissions from transport.

The diagram shows that, at the assessment year, the do-minimum levels of emissions are substantially higher than the current year. The grey dot at the assessment year shows the level of emissions with the assessed policy package.

As can be seen, the intervention shows a reduction compared with do-minimum. As such, a transport appraisal would show the cumulative savings of emissions between current year and assessment year compared to 'do-minimum' as this part of the environmental impact. Such an approach captures the benefits of an intervention compared to this hypothetical scenario in a clear manner.

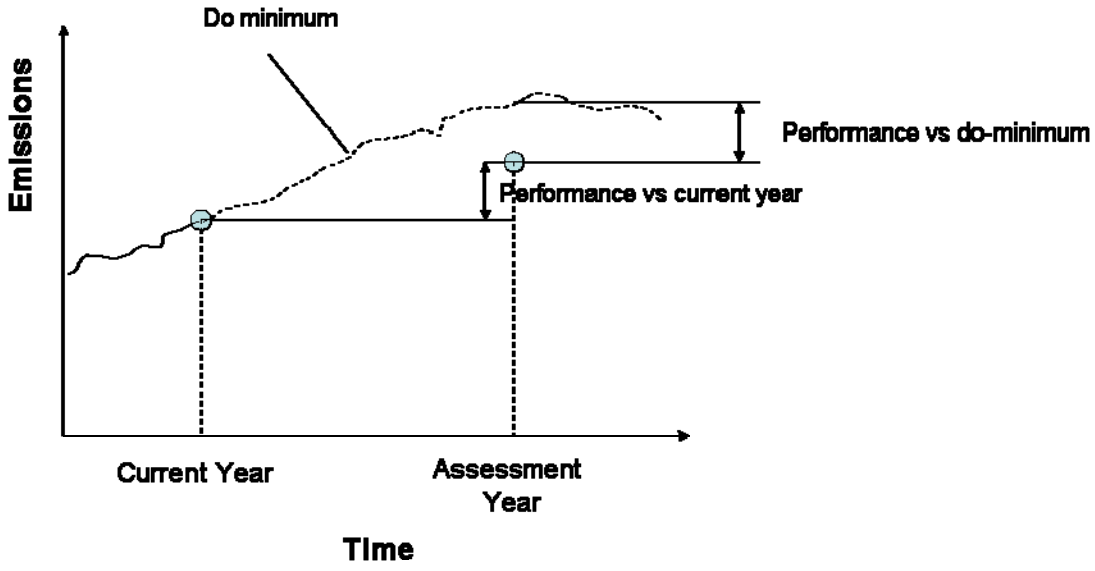

Figure 1: Do-minimum and intervention assessment

It is also clear from the diagram that the performance in the assessment year is worse (emissions are higher) than in the current year. The current transport appraisal approach presents the decision-maker with a positive outcome when the actual outcome suggests deterioration in environmental quality. Parallel examples could be demonstrated for measures of social and economic progress. There is a fundamental difference between an approach which examines progress compared to today's levels and that which examines progress compared to a 'hypothetical future'.

Of course, the assessment of sustainability is not as simple as comparing performance in the future with current performance. Alongside every indicator of sustainability there must be an indication of the direction of change from the current position that constitutes of progress. In some cases there is a scientific basis on which a particular end goal can be quantified (e.g. number of days of moderate or high air quality), for others (e.g. increasing community participation) an end goal is less clear but a direction of change relative to past trends can be stated. In the case of the former, not only is it possible to state an end goal but it is often the case that time periods over which the government wishes to move to achieve these goals are set (targets).

Where targets (such as environmental thresholds or minimum acceptable equity constraints) are set then the relevant metric for assessment is performance against progress towards these targets. Targets are, by their nature, set for discrete points in time. To form a meaningful comparison of progress towards long-term targets, trajectories of expected progress are required. These can be modeled or derived from approaches such as straight line interpolation. The policy relevant information is, in such cases, the difference between the assessment year value and the policy trajectory value as shown in Figure 2.

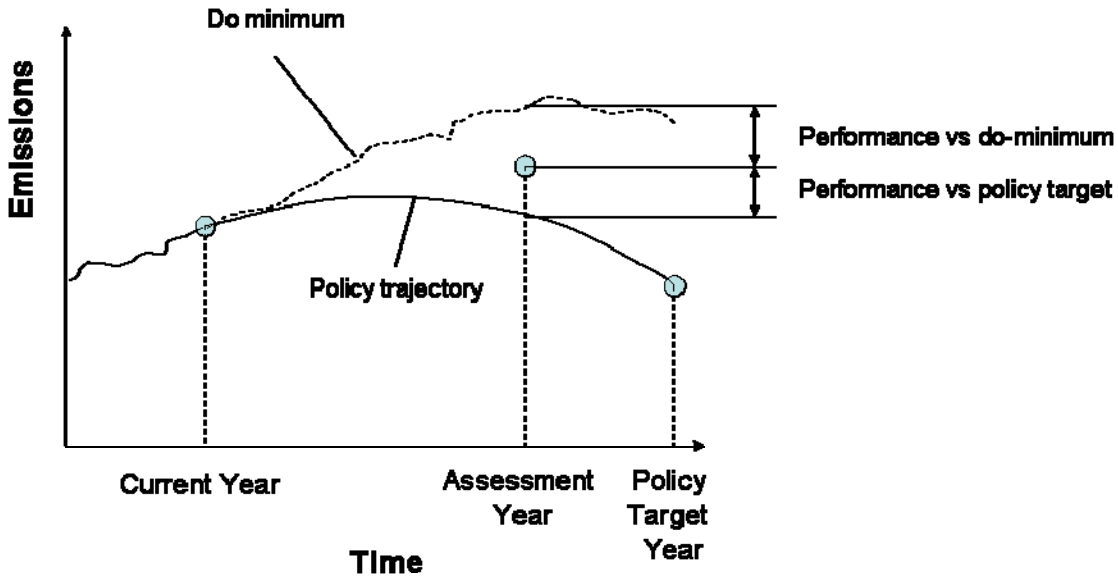

Figure 2: Do-minimum assessment versus policy target

Continuing the previous example, Figure 2 indicates a significant excess of emissions in the assessment year compared with the policy trajectory.

Whilst the end year position and direction of change are important, it may also be desirable for some indicators to consider the cumulative totals for the indicators over the period of assessment (for example, climate change gases where their effects may be felt for periods of 50 years). It may also be relevant to ensure that certain thresholds are not exceeded on the pathway to the assessment year (to ensure intra as well as inter generational equity).

The indicator led approach does not, unlike the Cost-Benefit aspects of NATA, attempt to provide an assessment of value for money. This is discussed further in Section 2.4.

2.4 The proposed framework

This section describes the proposed methodology for a sustainability appraisal. As set out in Section 2.1, appraisal involves the assessment of the extent to which a policy or project:

a) meets the aims of government; and
b) is value for money.

A schematic diagram of the approach is shown below in Figure 3. Each of the elements are then reviewed in subsequent sub-sections.

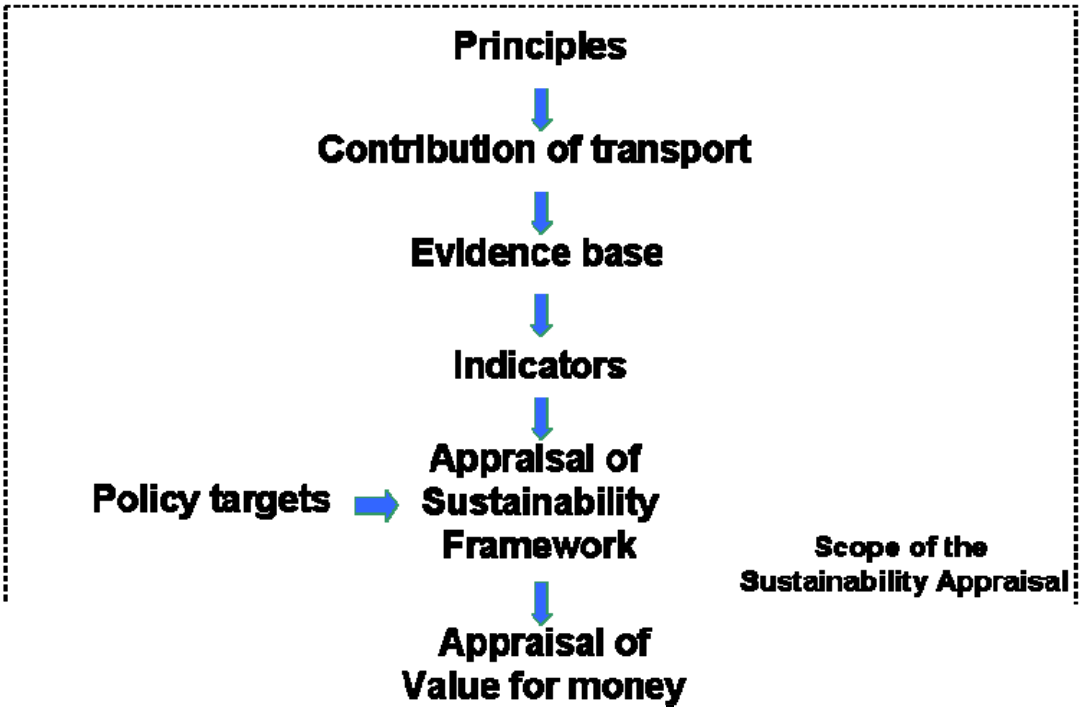

Figure 3: Schematic approach to developing 'sustainability appraisal'

2.4.1 Principles

It is essential to have a clear idea of the goals of sustainable development. Indicators can then be selected to proxy progress towards those goals. A review of the principles of sustainable development has been conducted (Kelly, 2005) to ensure that different perspectives on sustainability have been considered. Ultimately however it was felt that the project needed to be consistent first and foremost with the UK Sustainable Development strategy (DEFRA, 2005) and secondly with an interpretation of what this might mean for transport. For this, we took the European Council of Ministers definition of sustainable transport (ECMT, 2001).

There are of course 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 attempted to operationalise current agreed definitions and to employ available indicators where possible to ensure that the approach is consistent with government policy and practicable.

2.4.2 Contribution of Transport

The UK Sustainable Development Strategy contains a suite of indicators across the whole of government including transport. Due to the broad remit of the strategy the coverage of the indicators for transport, it was felt that a better targeted set of indicators is possible for the transport sector. The Sustainable Development strategy was also not developed as an appraisal

decision-making tool. The indicators in the strategy are sometimes therefore not suitable for use in ex-ante project and policy appraisal but rather perform a monitoring role. There was therefore a need to identify for each of the three pillars (and where relevant overlapping between pillars) a comprehensive suite of indicators.

The first element of the indicator selection was to take a first principles look at the relationships between transport and the environment, economy and society, ensuring that all of the aspects described by the UK sustainable development strategy and ECMT definition were covered. So, for example, definitions of economic growth were reviewed and the different ways in which transport might impact on this listed. This provided a comprehensive basis for a more structured examination of the evidence base on these interactions.

2.4.3 Evidence Base

Many relationships between transport and the three pillars of sustainable development were drawn up from the work described above. The evidence base for some of these linkages is well developed (e.g. the link between vehicle use, emissions, pollutant concentrations and health). For others it is the subject of pioneering research work (e.g. modelling the impacts of transport interventions on economic growth (see Oosterhaven and Elhorst, 2003 and Bröcker et al., 2004). For some, the relationship is intuitive but the evidence base flimsy or non-existent (e.g. the impact of car use on social interactions).

A review of the published evidence was therefore necessary to determine which relationships appeared robust and which less so. Only where a robust relationship exists can a meaningful indicator of progress be determined as only when the relationship is clear will it be clear what the measure of success will be. So for example, days when air pollution exceeds safe guidelines would be a clear measure well linked back to the transport emissions that contribute to them.

Where a relationship was expected to exist but was not well proven approaches that have been adopted to act as proxies for the relationships were also examined and adopted if appropriate. Where such relationships are applied this should be as an interim measure whilst further research establishes (or otherwise) the primary relationship.

2.4.4 Indicator selection

The stages above ensured, as far as possible, that indicators were selected only for those aspects of sustainable development policy where transport has a clear and well understood impact. To avoid duplication of existing indicator

sets, where possible the indicators selected were chosen to correspond to indicators already in use. The use of existing indicators is also consistent with the existence of well established baseline trends and, in many instances, policies and targets that provide a clear indication of the expected direction of change of the indicator. Where no suitable indicators were available to match the relationships identified, new indicators were derived. The derivation and selection of indicators is a notoriously controversial task. In selecting indicators we adhered to best practice developed through the DISTILLATE Sustainable Urban Environment project (Marsden et al., 2005). The indicators selected are set out as a list in Section 3. Three separate reports accompanying this document provide an expanded justification for the selection of each of the indicators proposed.

2.4.5 Policy targets

For a suite of indicators to be of use in ex-ante decision-making, it is essential to know in what direction and, preferably, how quickly the organisation would like the indicators to change. It is this comparison of expected performance against stated goals that provides the assessment of any potential sustainability gap. Alongside each of the indicators, information is given about the expected direction of change and any targets that can be adopted.

For this project we have adopted government targets for environmental improvement, social progress and economic growth as the basis for defining 'sustainable' levels. There is a spectrum of views as to whether governmental targets are sufficiently stringent to constitute 'sustainability'. It would be possible to apply this methodology to any set of targets proposed. However, the rationale for the development of this tool is to improve the consideration of sustainability issues in transport appraisal. The priority is that it is consistent with stated governmental aims and is therefore consistent with other aspects of the transport decision-making process. As environmental, economic or social policy evolves, the targets (and potentially indicators) that form part of this appraisal should also evolve.

Targets and policy commitments that represent sustainable development are, by their nature cross-cutting over many departments. Where it is possible, specific departmental targets should be adopted (e.g. road traffic accidents as part of an overall desire to reduce accidental loss of life). In some cases this activity has not yet been completed, such as climate change, where the extent to which the Department for Transport should seek to reduce emissions has not yet been adequately separated out from the overall governmental target. In such cases the cross governmental target has been adopted in the short-term although the need to re-examine these is strongly stressed. In other cases, particularly with issues of social progress no attempt has been made to specify basic minimum standards of provision or to determine what an

acceptable gap in affordability, for example, between different income quintiles is. A framework approach such as this puts the spotlight on these issues. It is perhaps not surprising that the social aspects of transport policy are poorly represented within current appraisal approaches whilst the end goals remain so fuzzy.

2.4.6 Appraisal framework

One of the main purposes of this approach to appraisal is to provide decision-makers with a manageable set of information about the core indicators that capture progress towards sustainable development. The ultimate objective of a sustainable transport policy is to bring forward interventions that improve all aspects of each of the three pillars of sustainable development – the triple bottom line. For integrated policy packages, such as national transport policy, Regional Transport Strategies or Local Transport Plans, this would appear to be a fundamental requirement to demonstrate consistency with the principles of sustainable development.

Individual policies and projects are likely to demonstrate conflicts between indicators. However, where the overall strategy has been considered at a higher level it should be possible to determine whether particular schemes or packages are consistent with the contribution anticipated at the higher level. So for example, it should be possible to determine what the total contribution of the Highways Agency's programme of works is to the total national policy and for the Highways Agency to work to these constraints. Equally, different local authorities may contribute different amounts to each indicator at a regional level but the contributions should be identified as constraints within which their packages should be designed.

Several approaches could be applied to the indicators to resolve the conflicts between indicators that are not consistent with sustainable trends. Multi-criteria analyses with weightings applied to each indicator have been adopted in some parts of Europe as a means of developing an overall index of sustainability that must be improved. The approach proposed here is to identify whether each indicator is in line with a sustainable trend and to allow the decision-maker to make an informed choice based on the information in front of them. This provides a transparent account of the extent to which different factors have been considered but does not artificially constrain the decision-maker. A review of decisions taken during the 1998 Roads Review found that decision-makers used a wide range of the NATA criteria and that decisions were not dominated by sole use of the cost-benefit figures (Mackie and Nellthorp, 2000), which gives some scientific support to the view that decision makers working in the field of transport project/planning decisions with many options and limited budget, can make consistent decisions based on multi-objective data.

2.4.7 Value for money

The proposed sustainability framework addresses the extent to which the overall aims of government are met. Costs of investment and revenue support are included in the framework (under the economy pillar). Value for money is not the focus; however the assessment of value for money is already fairly well developed within the current NATA appraisal outlined at 2.2.1 (DfT, 2005).

Concern was expressed by consultees about the exclusion of value for money from the sustainability appraisal and that this would lead to the development of wish lists of projects. It is worth noting that the same criticism was levelled at the outcomes of the multi-modal studies – i.e. that the projects were unaffordable even though they produced sufficiently good cost:benefit ratios (Marsden, 2005). It seems intuitive that provided agencies are given financial planning envelopes to work within they will develop best strategies within these constraints and we would recommend that. This is the approach being adopted to LTP funding.

We also believe that the preparation of a detailed value for money assessment is resource intensive, particularly at a strategy level and option selection stage. We suggest that the more light touch approach to presenting the costs and benefits proposed here allows sustainable strategies to be identified from within which the best value for money option is then calculated.

3 Indicator Suite

3.1 Indicators

This section summarises the indicators that are proposed for adoption. The indicators were selected following the procedures set out in Section 2 and were further refined following discussions with the stakeholders listed in Section 1.2.

In line with the way the work was structured, the indicators are presented under three headings of environment, economy and social. We emphasise here that the boundaries between the three headings are fuzzy and that the indicators should be viewed as a suite rather than three competing pillars with the objective of any complete strategy to achieve wins across the indicator suite.

Table 3 shows the summary list of indicators. The rationale and further information supporting the selection of the indicators can be found in three accompanying reports:

- Environment Indicators
- Economy Indicators
- Social Indicators

3.2 Comparison with NATA and SEA

As discussed in Section 2, there are some philosophical differences between the approach proposed here and that currently existing within NATA. As Table 3 shows, there are also some differences (as well as commonalities) between the indicators proposed for a sustainability appraisal and those currently applied in transport appraisal. Even where the indicators appear similar (e.g. economy) we stress that the different application of the framework and indicator components may lead to different outcomes. Table 4 shows the differences between NATA and the proposed sustainability framework and also compares both approaches to the requirements for SEA.

There are two key areas of difference between the NATA indicators and those put forward within this project:

3. The sustainability framework covers the efficiency of environmental resource use which is not reflected in NATA. Pearce (2000) suggests that the efficiency of resource use is a common goal across proponents of both weak and strong sustainability approaches.
4. The coverage of social issues is far more comprehensive within the framework than is currently the case within NATA. These indicators are only meaningful when used as direct measures of change (rather than comparators with do-minimum figures).

It is worth noting that NATA also includes the integration indicators which we have discounted (Section 2.2.3) and measures of journey ambience and increased option values. Journey ambience should be captured through actual (rather than theoretical) accessibility but current approaches are someway off from being able to achieve this. Option values are again partly covered by accessibility although the degree to which these are really reflected warrants further research.

We also highlight in the table the role that wider economic impacts have in NATA in the form of Economic Impact Assessments. There is no well developed science for predicting the economic impacts of transport interventions as noted earlier. Stakeholders suggested to us that there may be many types of economic impacts that could not be captured through our proposed short-term approach. We believe that in most cases, the majority of the benefits would be well represented by our approach but cannot rule out the need for further assessments being required.

Table 3: Indicators suite for sustainability appraisal

Environment			
Area of Progress	**Indicator of Progress**	**Disaggregation**	**Direction of change**
Pollutant Absorption Capacity	Total CO_2 emissions	-	Down – 20% cut by 2010 compared to 2000 levels and 60% by 2050
	Cumulative Total CO_2 emissions	-	Down compared with existing annual rate played forward
	Total NO_x emissions	-	Down – UK total to be 1,167 thousand tonnes by 2010 EU National Emissions Ceiling Directive
Resource Efficiency	Total non-renewable energy by all transport	-	Down
	Energy use per person-trip	Personal travel only	Down
	Energy use per tonne-km	Freight only	Down
Direct impacts on health	Exceedences of air quality objectives (NOx and/or PM10)	At risk groups (e.g. % of people suffering Chronic Heart Disease)	Down (standards set for 2005 and 2010)
Local quality of life	Number of residences exposed to aircraft noise above 57 LAeq,T		Down
	Number of residences exposed to noise above 55dBA		Down
Environmental Capital	Qualitative environmental capital score (7 point scale)	Landscape Townscape Heritage of Historic resources Biodiversity Water Quality	Cumulative impact of policies neutral or beneficial

Economy			
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* Operator Gains Public Finance Balance	Increasing (strictly Non-decreasing)
Society			
Area of Progress	**Indicator of Progress**	**Disaggregation**	**Direction of change**
Poverty	Average real cost of journey to key destinations	By car and public transport	Reduced ratio between car-based and public transport options
Accessibility	Weighted journey times[1] to: • key centres of employment; • primary, secondary & further educational facilities; • primary health care provider[2] & general hospital[3]; • key food shops	By car and public transport[4]	Reduced ratio between car-based and public transport options

[1] It may be advisable to also include cost of journey to these destinations with some indication of costs over e.g. £1 being non-affordable for low-income households and highlighting disparities in cost between car and public transport

[2] Doctor's surgery, health centre, NHS walk-in centre

[3] Hospital offering A&E and other key services

[4] Can also be disaggregated by particular relevant groups (e.g. health care facility by % of people suffering Chronic Heart Disease; primary school by % of children under 11 years; etc.) and also by housing tenure (the latter may be particularly in rural areas where low-income households are more likely to have higher levels of car ownership).

Safety	Killed and Seriously Injured	Disaggregate by index of deprivation, teenage deaths by driving and child pedestrian deaths	Reduce number KSI by 40% (50% child KSI) by 2010 compared with the average for 1994-98 plus reduced disparity between social groups
	Recorded incidences of crime on public transport	None	Down overall and improved perceptions of safety
Walkability	Percentage of residents living within 1000m or 15-minute 'safe walk'[5] to key destinations (e.g. health, educational, leisure and cultural facilities, food shops, post office, etc.)	Can be disaggregated by particular relevant groups (e.g. primary school by % of children under 11 years).	Up
Housing	Real lowest 10% value of house prices within x minutes (based on average local journey times to employment) of: a) The town centre and b) Key centres of employment	Disaggregated by public transport and car	Down

[5] Determined by an official safe route. A safe cycle route to these destinations could also be included

Table 4: Comparison of NATA and Sustainability Framework Indicators

NATA Objective	NATA Sub-Objective	Sustainability Framework	SEA topic
Environment	Noise	Noise exposure	Human health, population, inter-relationships
	Local air quality	Air quality *exceedences*	Air, human health, population
	Greenhouse Gases	Annual *and cumulative* CO_2	Climatic factors
	Landscape	Landscape	Landscape
	Townscape	Townscape	
	Heritage	Heritage	Cultural heritage..
	Biodiversity	Biodiversity	Biodiversity, flora, fauna, soil
	Water environment	Water environment	Water
	Physical fitness	*Walkability*	Human health, population
		Total non-renewable energy by all transport	Material assets
		Energy use per person-trip	Material assets
		Energy use per tonne-km	Material assets
		Total NO_x *emissions*	Biodiversity, flora, fauna, soil, water
Safety	Accidents	Accidents	Human health, population
	Security	Public transport security	
Accessibility	Community severance	*Weighted journey times (walk, wait, travel) to key destinations*	Population
	Access to the transport system		
		Average cost of journeys	
		Cost/km car:Cost/km public transport	
		Lowest 10% value of house prices within x minutes (based on average local journey times to employment) *of:* *The town centre and* *Key centres of employment*	
Economy	Public accounts	*Net benefits measured in the transport sector using WebTAG methods or (in future) by modelling GDP effects.*	Material assets
	Business users and providers		
	Consumer Users		
	Improve reliability		
	Wider economic impacts		

4 Conclusions and the application of the framework

This section describes where the framework might be applied and discusses implementation issues that will be explored through Stage 2 of the project.

4.1 Application of the framework

The context of appraisal in transport was set out in Section 2. The current requirements and where we suggest the framework should first be applied are shown below in Table 5 and in the discussion that follows. It would perhaps be seen as a retrograde step if all we were to propose was one further level of appraisal burden on the transport profession. However, we believe that the approach proposed can work with, refine and replace parts of the existing process.

Table 5: Appraisal Procedures and Scope for framework application

Strategy Level	Assessment Procedure				
	NATA	LTP	SEA	ODPM SA	Framework
National Transport Policy	✓✓				Yes
Regional Spatial Strategy (Regional Transport Strategy)	✓		✓✓	✓✓	Yes
Local Transport Plan	✓	✓	✓✓		Yes

✓✓ Requirement
✓ Influences

4.1.1 National Transport Policy

The sustainability of national transport policy is already assessed, in part, through the indicators used in the UK sustainable development strategy (DEFRA, 2005). The indicators monitored there are not the same as those that form the basis for the appraisal of major transport schemes or local transport plans.

As described in Section 3, the framework proposed here does not exclude any of the factors considered in NATA but does suggest some important additional indicators to be considered. The indicators form the missing link between sustainability reporting and strategy appraisal. We would therefore suggest that the indicator framework is an easier and potentially more consistent way of both assessing and monitoring the progress towards key sustainability targets than NATA. It is more difficult to see the NATA indicators being applied to national strategy than it is to scheme appraisal.

As discussed in Section 2, it would also be desirable for national transport policy to determine broadly what is expected from the different regions and different national infrastructure providers for each of the indicators. From this perspective, adoption at a national level is highly desirable.

4.1.2 Regional Transport Strategy

Regional Transport Strategies, as part of Regional Spatial Strategies are already required to be part of both a Sustainability Appraisal (through planning legislation) and SEA (ODPM, 2005). The Sustainability Appraisal is supposed to draw on the indicators and appraisal processes from transport (i.e. NATA). Early experience in the conduct of sustainability appraisal at a regional level has shown there to be difficulties in establishing a meaningful framework and in conducting the assessments (Ferrary and Crowther, 2005).

There therefore appears to be an opportunity for adoption of a framework based on sustainable development principles *at a regional level*, to fulfil existing legislative requirements and to clarify and standardise existing approaches. We think the framework developed in this study has some potential in that rôle.

4.1.3 Local Transport Plans

The Local Transport Plans are developed in line with extensive guidance produced by the Department for Transport (2004). The LTPs are supposed to be consistent with the NATA framework. Any major scheme bids are subject to a full project appraisal using NATA. Interviews as part of another project (Marsden and Kelly, 2005) and responses from consultees suggest that NATA is unwieldy and consequently underused for strategy level assessments at the local level.

Given the requirements for local transport plans to be subject to an SEA this framework could enable a large number of the SEA requirements to be fulfilled without increasing the appraisal workload. It also promises to be more intuitive and user-friendly in strategy development and assessment than NATA. We intend to test the application of the framework to fulfil this role in the coming months (see Section 4.2).

4.1.4 Scheme appraisal

Sustainability needs to be considered first at a strategy level and then at a scheme level. We anticipate a staged approach to applying the framework with the contributions of different parts of the strategies identified at the strategy level. These may then be used as constraints within which a scheme design occurs. This would allow the NATA framework to be applied *within* the sustainable development policy, but without requiring any changes to NATA.

An alternative approach might be to supplement the NATA framework with some of the missing indicators or some hybrid of these two possibilities. Once the concept is demonstrated at a strategy level we recommend that its application at a scheme level be tested. Clearly if the schemes that are

implemented do not add up to the ones proposed by the strategy then sustainable outcomes are less likely. However, the framework can only ensure consistent consideration of the key factors. Having a sound decision-making and monitoring process is equally necessary, but necessary whatever the appraisal framework looks like.

4.2 Testing the framework

In developing the framework there were many approaches and indicators that were considered and rejected as a result of the consideration of implementation and practical issues. A hypothetically sound framework which couldn't be used is only of academic interest but many such approaches already exist. We preferred to adopt a pragmatic approach to moving this area forward. The final stage of this is to test the framework using existing models and data sets. The aims of the tests are to:

5. Determine which indicators are practical to forecast with current techniques
6. Compare several transport strategy options using the appraisal framework
7. Consult stakeholders about the usefulness and applicability of the results
8. Identify gaps in our capabilities to assess the sustainability of transport projects.

This stage of the project will be conducted using a series of model runs of alternative transport strategies developed using a Metropolitan area's strategic land-use transport interaction model. The work will be conducted in the later quarter of 2005 and first half of 2006.

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