

The Evaluation of Major Local Authority Transport Schemes: A Guide

Contents

| | |
|--|-----------|
| Executive Summary | 4 |
| 1. Introduction | 6 |
| 2. What is Evaluation? | 8 |
| 3. Preparing and Managing an Evaluation | 13 |
| 4. Impact Evaluation | 28 |
| 5. Process Evaluation | 41 |
| 6. Presentation and Use of Evaluation Results | 57 |
| 7. Glossary | 62 |
| 8. Bibliography | 66 |
| Appendix A. Transport Scheme Objectives | 68 |
| Appendix B. Impact Data Collection Techniques | 74 |
| Appendix C. Transport and Land Use Modelling | 85 |
| Appendix D. Aspects of the Evaluation of Regeneration Impacts | 89 |

List of Tables

Table 5.1 Examples of Cell Entries in Interaction Matrix

Table 5.2 Matrix of Interactions Between Players and Activities in the Development and Implementation of a Major Scheme

Table 6.1 Presentation of the Evaluation Report

Table A.1 Illustrative Appraisal Summary Table - for a Local Authority Major Scheme

Table B.1 Data Sources Relevant to Land Use Change and Other Wider Impacts

Table D.1 Regeneration Impacts and measurement Techniques

List of Figures

Figure 3.1 Key Steps in an Evaluation

Figure 3.2 Planning for the Unexpected

Figure 4.1 Causal Chains for Impacts of a New Ring Road about Four Miles from a Medium Size town Centre

List of Boxes

Box 3.1 Case Study: London Congestion Charging Evaluation

Box 3.2 Case Study: Okehampton By-Pass Evaluation

Box 3.3 Case Study: Sheffield Supertram Evaluation

Box 3.4 Case Study: Skye Bridge Socioeconomic Impact Study

Box 3.5 Common Pitfalls of Evaluation

Box 4.1 Modelling the Impacts of a Transport System

Box 4.2 Selected Statistical Measures and Techniques

Box A.1 Example of Local Transport Plan (LTP) Objectives

Box C.1 Reference Works for Transport Modelling

10 May 2006

NERA
Economic Consulting



Project Team

NERA

Michael Spackman

John Dodgson

Simon Maunder

MVA

Jacqui Dunning

Andy Skinner

Dave Carter

David Simmonds Consultancy

David Simmonds

Andy Dobson

NERA Economic Consulting
15 Stratford Place
London W1C 1BE
United Kingdom
Tel: +44 20 7659 8500
Fax: +44 20 7659 8501
www.nera.com

MVA
Third Floor
One Berners Street
London W1T 3LA
United Kingdom
Tel +44 (0)20 7612 3700
Fax +44 (0)20 7436 9293
www.mva-group.com

Executive Summary

The need for evaluation guidance

Transport carries a good reputation for the appraisal of schemes before implementation. Less well developed however is the use of retrospective impact evaluation, for accountability, or to inform the planning, appraisal and delivery of future schemes, or of retrospective process evaluation to help ongoing or future scheme management.

Purpose of the Guide and target audience

This Guide promotes well planned and proportionate evaluation, primarily for local authority Major Schemes outside London. It presumes that evaluation plans will be required with funding applications for such schemes, which normally have a capital spend of more than £5 million. The Guide provides advice and ideas, not binding requirements, as flexibility is needed to tailor evaluation to specific scheme and knowledge gaps.

The scope and scale of evaluation

Evaluations may vary widely in purpose and in scope and scale, depending on the nature of the scheme and the purpose of the evaluation. Evaluation for accountability needs however to review capital and ongoing expenditure as well as scheme impacts. Evaluation to provide information for future use should be directed at explicit needs and specific users.

Care is needed to ensure that, whenever it is used, the meaning of the term evaluation is clear, since, while in this Guide and usually in central government it is confined to retrospective analysis, the word is widely used elsewhere to describe forward looking appraisal. It is helpful to distinguish between impact and process evaluation, and sometimes to develop thematic evaluation of a specific activity, such as capital procurement, for a single scheme or possibly across a range of applications and over time. The terminology of "counterfactual" is adopted in central government and many local authorities to describe the alternative world against which the observed outputs and outcomes are being compared.

The key steps of managing an evaluation are deciding its purpose, planning the evaluation (including choice of performance indicators, methods of data collection and sources and methods of analysis, and risk assessment of the evaluation), followed by a management structure for the work itself, contract management, and presentation and dissemination. Common pitfalls include starting too late, lack of clarity of the purposes of the evaluation, poor evaluation planning and insufficiently effective presentation.

The resources appropriate for evaluation in a specific case, in such a broad field as local authority schemes, cannot be decided by formal rules; but for a scheme with a capital cost of £10m, evaluation should cost less than £100k. The evaluation budget or budgets should be planned in advance and incorporated in the scheme budget.

Structure of the Guide

The Guide, after explaining its background and the nature of evaluation, devotes sections to preparing and managing any evaluation and then more detailed coverage of impact and of process evaluation, followed by a chapter on the presentation and use of evaluation results.

Impact evaluation needs to consider impacts, positive and negative, on the achievement of all transport policy objectives, as well as the beneficial impacts stated in promoting the scheme. There may also be an important place for thematic impact evaluation focused on one specific issue. The timing of an impact evaluation depends upon its purpose, and may vary from between a year or so after initial opening of a scheme to many years later after, for example, business location, housing and planning decisions have adapted to a major scheme.

Identification and estimation of this counterfactual is a central feature of most impact evaluations and may be derived in a number of ways. For a small scheme simple adjustments for general trends may suffice. For a large scheme formal modelling is needed, using either the original appraisal model or a new model. An analytical framework is needed, often including causal chain diagrams, and best use should be made of choices from a wide range of data collection and data analysis techniques. Three illustrative examples of impact evaluations are provided of stylised local authority major schemes. Appendices provide more detailed guidance on transport scheme objectives, data collection, modelling and regeneration impacts.

For process evaluation the first step again is to determine its scope. This may, in a few cases such as a scheme which was unusually successful or unsuccessful, extend to the scheme as a whole. This will entail consultation with a wide range of players and analysis, perhaps using project management software, of all the material interactions between players and activities. More often, process evaluation will be worthwhile for one or more specific activities, such as capital procurement, concession arrangements, handling of environmental issues, the implementation process, or media handling. Illustrative questions are suggested for such cases.

The usefulness of any evaluation depends largely or wholly upon the presentation and use of evaluation results. The need for publication, or risk of exposure to public scrutiny, may sometimes be a constraint on impartial reporting, but this is undesirable and there are ways in which these pressures can be mitigated. Presentation should "tell a story" and be targeted to the particular needs of each audience. The main output of evaluation for accountability may be the executive summary. Do's and Don'ts are suggested for evaluation reporting and dissemination.

1. Introduction

- *Background to this Guide*
- *Intended audience*
- *Structure*

1.1 Background to this Guide

Public sector transport programmes in the UK have earned a good reputation for the appraisal of schemes prior to implementation. Precise modelling tools and assessment techniques have been developed to forecast the costs and benefits of investment, but little subsequent work is done to evaluate whether funds have been used efficiently and effectively, or to learn lessons for future projects.

Many authorities monitor the impacts of major schemes, often as part of their wider Local Transport Plan monitoring. However, this tends to focus narrowly on traffic flows and patronage outturns, excluding some of the wider effects that were quantified in the appraisal. Some authorities have participated in Gateway Reviews that consider aspects of delivery, but these are concerned with the development of the project in hand rather than the evaluation objectives of accountability and systematic provision of lessons for future projects.

Overall there is little evidence of retrospective evaluation being used to inform the planning, appraisal and delivery of transport improvements.

This Guide addresses these concerns by promoting well planned and proportionate expenditure on evaluation to:

- demonstrate that local transport policies are working and that scarce public funds are used wisely;
- understand how a scheme has progressed to help steer ongoing scheme management; and
- provide lessons for local authorities and for the Department of Transport to help continuously improve scheme choice, design, procurement and management.

The Guide describes the main types of evaluation and offers advice on issues to investigate and the techniques that can be used. In contrast to guidance on appraisal it is not prescriptive, since each scheme and its context is unique and the scope for worthwhile evaluation varies widely. It is up to the promoter to determine the exact nature of the investigation, depending on factors such as the policy context, type of scheme, overall cost and risk assessment.

For more innovative or expensive schemes, an evaluation plan may need to be devised in consultation with the Department at the programme entry stage. The Department will generally require clear and costed evaluation plans to support a major scheme bid, depending on the nature of the scheme. This Guide is to help the development and implementation of such plans, by defining what is meant by evaluation and its purpose in the context of transport schemes, and providing practical guidance.

The Guide is aimed at the evaluation of local authority Major Schemes and is consistent with the coverage of evaluation in section 6 of the Department for Transport "Guidance to Local Authorities seeking DfT Funding for Transport Major Schemes".¹ Much of its coverage applies also to other

¹ Consultation paper as updated April 2006 at http://www.dft.gov.uk/stellent/groups/dft_localtrans/documents/divisionhomepage/038049.hcsp

significant schemes, such as those funded by the Community Infrastructure Fund and Transport Innovation Fund, although separate guidance may also be provided, tailored to specific Funds.

1.2 Intended Audience

This Guide is formally addressed to those concerned with the promotion of local authority major schemes in England outside London, this being the scope of the Department for Transport's financial involvement in local transport.

The early chapters are relevant to scheme sponsors and evaluation managers, at the scheme funding stage when they are devising an evaluation plan, and also during or following scheme implementation, when they are about to undertake a scheme evaluation.

Chapters 4 and 5 provide more detailed guidance on impact and process evaluation, and so will be useful to evaluation managers and public sector practitioners undertaking evaluations and reporting the findings.

1.3 The Structure of This Guide

Chapter 2, under the heading of "What is Evaluation?", considers *the purposes of evaluation and explains the terminology* used to describe evaluation in its various forms, and how it relates to Gateway Reviews.

Chapter 3 provides guidance on the *preparation and management of an evaluation*, from the early stages of designing an evaluation through to tendering the work and reporting the findings.

Chapters 4 and 5 focus in more detail on *impact evaluation and on process evaluation*. Much of the ground on impact evaluation in particular will be familiar to most users of this Guide, but these chapters are designed to provide useful benchmarks both for practitioners and for those preparing specifications and assessing evaluation proposals.

Chapter 6 discusses the *use of evaluation data*, and the potential for local authorities, individually or collectively, and the Department for Transport, to help to develop this somewhat under-researched field.

These Chapters are followed by a Glossary and a Bibliography.

2. What is Evaluation?

- *Purposes and benefits of evaluation*
- *Terminology and types of evaluation*
- *Evaluation and Gateway Review*

2.1 The Purposes and Benefits of Evaluation

The Guidance to Local Authorities seeking DfT funding for transport Major Schemes² explains that, in the context of Local Authority major transport schemes, evaluation is:

"...an independent quantitative and qualitative assessment of the processes of implementing a scheme and its impacts. Evaluating major schemes will help the Department meet its commitment to assess the impacts of its policies, and provide the Department and authorities with valuable evidence to inform future scheme development and decision-making."

Evaluation is often presented in general guides as one stage in an "appraisal and evaluation cycle", after a scheme has opened. This is useful as a stylised outline of why it can be worth looking back at a scheme.³ But in practice, for the promoter of a major transport project, evaluation is much less of a "one model fits all" activity than appraisal.

Evaluation may vary widely in scope, depending on its precise objectives. It may for example focus on a scheme as a whole, or on one theme, such as capital procurement or concession negotiation, or on one theme across a number of schemes, or on impacts (as outputs and outcomes), or on processes. Evaluation may also vary in timing. Most often it is applied after opening (following preparation and data collection from often well before the start of works), but the appropriate interval after opening depends upon the evaluation objectives; and some evaluation work is often appropriate before a scheme opens, to help inform the subsequent project management.

Since the (possibly multiple) objectives of an evaluation largely determine its design it is important to make the evaluation's objectives clear, both in its planning and in its subsequent reporting.

The DfT quotation above distinguishes between assessing impacts for accountability, and providing evidence to inform future decision making.

The comparison, for *accountability*, of some measurement of actual outturn with the outturn promised when the scheme was proposed is clearly in the public interest. The benefit to local authority sponsors and to central government is also clear, despite the potential difficulties, discussed in Chapter 6, of reporting bad news. It provides valuable feedback to the project sponsor, reliable data for VFM auditors and, if carried out systematically over time, a valuable reputation for good management. Less well established however is the scale of work justified to achieve this accountability objective. It is also not always recognised that, for accountability, information is needed on capital and ongoing costs

² See footnote 1.

³ For example the current (2003) edition of the Treasury Green Book adopts the acronym used in some public bodies of ROAMEF – Rationale, Objectives, Appraisal, Monitoring, Evaluation, Feedback. The World Bank "Project Cycle" presents Evaluation in a similar way, although in that case from the perspective of an external financier. Its independent Operations Evaluation Department prepares an "audit report" and evaluates the project, for internal accountability and to provide lessons for future project design.

and implementation timescale, as well as on impacts in terms of service delivery, the environment and local development.

Evaluation to provide *information for future use* must be directed at explicit needs and at specific users. For example, evaluation can provide feedback on:

- The appropriateness and robustness of particular methods of modelling and appraising schemes. Bids for major schemes are based primarily on the scheme appraisal using the Government's NATA criteria.⁴ One potential role for evaluation is to exploit the scheme as a field experiment to test the model parameters and the robustness of forecasts of travel demand and of associated social, environmental and economic impacts.
- Progress in capital procurement, particularly with avoiding optimism bias. The issues of predicting and preventing capital project overspends and overruns, in transport as in other fields, is long standing, but has gained a higher profile in UK government in recent years. It is also widely perceived as an issue for which no satisfactory procedures have as yet been developed. The Department for Transport sees a potential role for evaluation in providing a systematic record of capital procurement plans and outturns over time and across projects, which might be used, for example, to help determine well-based adjustment factors to apply to capital cost projections.
- The success (or lack of success) of a policy or engineering innovation to deal with transport problems and the reasons behind this. Some transport projects employ novel approaches to achieve, for example, lower cost, quicker or less disruptive construction, or better or less damaging environmental impacts, or better integration between transport modes, or with other public services, or with local regeneration plans. A potential role for evaluation is to assemble and present information on the effectiveness of such approaches for potential future application; especially where the innovations are successful (as failures tend more often to generate their own publicity).
- The design and management of concessions, or other aspects of management and working practices. This may sometimes be to inform the ongoing management of the scheme.

Some of these opportunities for learning, notably on management and working practices and sometimes on policy or engineering innovation, are benefits to the local authority scheme sponsor. Others may more often be to local authorities collectively or to central government. This distribution of benefits should normally be reflected in the mechanisms for defining before grant approval what evaluation should be planned and how it should be funded and recorded.

2.2 Terminology

2.2.1 Evaluation and some related terms

Confusion sometimes arises between the terms **evaluation** and **appraisal**.⁵ The usual convention in central government, as set out for example in the Treasury Green Book⁶, is to use "appraisal" to describe the forward looking (or sometimes "ex ante") assessment of proposals, and "evaluation" to describe retrospective (or sometimes "ex post") assessment after the scheme has started to operate. However "evaluation" is often used outside central government, and sometimes within it, to describe

⁴ The New Approach to Appraisal (NATA) criteria – see WebTAG *Introduction to Transport Analysis* <http://www.webtag.org.uk/>

⁵ The terms in this section, and elsewhere in the Guide, are also defined in the Glossary.

⁶ HM Treasury (2003) *The Green Book: Appraisal and Evaluation in Central Government*, London, TSO, paragraph 1.8.

either forward looking or retrospective assessment, and it is not always clear which is intended. It may even be used to describe the process of deriving monetary values.⁷

Throughout this Guide the words appraisal and evaluation are used in their Treasury Green Book senses of forward looking and retrospective. This does not however imply any single timing for evaluation. Some process evaluations, for example, are before a scheme opens.

Also potentially confusing are the distinctions between the terms **evaluation**, **monitoring** and **audit**.

Evaluation is retrospective analysis taking place at a discrete point in time.

Monitoring is a continuous process, typically to observe trends over time, or departures from a norm. However evaluations often use data generated by monitoring and, in practice, plans for evaluation and monitoring may heavily overlap or even merge. Generally the requirement as a condition for grant approval by DfT of project evaluation plans will include plans for monitoring.

Audit, in the form of value-for-money audit as opposed to financial audit, has much in common with evaluation by the sponsoring body. However it is conducted or commissioned by an audit authority for that body's own objectives, usually concerned with accountability, and is generally less wide-ranging in scope than an evaluation by or for the project sponsor.

2.2.2 How types of evaluation are described

It is helpful to distinguish clearly between **policy**, **programme** and **project** evaluation.

The evaluation literature is concerned largely with *policy* evaluation, where (since policies are concepts, not fixed in time) the distinction between retrospective and forward looking analysis becomes blurred and may disappear. This may be one reason why there is so little literature on the retrospective evaluation of capital procurement. This Guide is about *project* evaluation (transport projects being usually described as "schemes"), which is unambiguously retrospective. Lying between policy and project evaluation is programme evaluation, as covered for example in the European Commission's main evaluation guide.⁸

Evaluation, whether of policies, programmes or projects, is sometimes described by the kind of general activity that is being evaluated:

- Evaluation may focus on impacts, as outputs and/or outcomes. This **impact evaluation** has historically been the most common form of evaluation in transport.
- Evaluation may also focus on planning and management. This is **process evaluation**.
- The term **thematic evaluation** is sometimes used to describe evaluation of a single theme, such as, for example, development impacts, or traffic flow impacts, or capital procurement. This may be for one scheme, or it may be across a number of policies, programmes, or schemes.

Evaluation is also sometimes described in terms of its wider purpose or timing:

- Prominent in much evaluation literature are the terms **formative evaluation** and **summative evaluation**. However these terms are applied most often to programme evaluation. They are less well suited to project evaluation and, while defined in the Glossary, are not used in this Guide.

⁷ The European Commission uses "evaluation" to describe both ex post and ex ante assessment, but avoids ambiguity by being explicit. For example its Guide on ex post Programme Evaluation refers to "ex ante evaluations (conducted before implementation), which are sometimes referred to as appraisals".

⁸ European Commission (1997) *Evaluation of EU Expenditure Programmes: A Guide*, Luxembourg, Office for Official Publications of the European Communities.

- A distinction is also sometimes drawn more simply between **intermediate evaluation** and **ex post evaluation**, intermediate evaluation being conducted during an activity and ex post evaluation on or after completion of the activity.

2.2.3 *The counterfactual*

Both appraisal and evaluation are always comparing alternatives. For forward looking appraisal the main alternative, or **counterfactual**, to the option being appraised is usually a do-nothing or do-minimum scenario. For retrospective *impact* evaluation for accountability the counterfactual is usually the outputs and outcomes and state of the world (i.e. external circumstances) as forecast at the time that the project was approved. For *process* evaluation the counterfactual is usually the evaluator's own perception of some better, or possibly worse, alternative process that might have been pursued, or an alternative state of the world.

An effective evaluation or appraisal will always make clear what is being evaluated or appraised and the counterfactual with which it is being compared.

2.3 Evaluation and the Gateway Review Process

The Gateway Review process was developed originally by the Office of Government Commerce for central government and subsequently adapted under licence by the 4Ps for use by local authorities.⁹ Only a few local authorities, promoting unusually large or potentially risky schemes, have so far made use of the Process, but it is likely to become more widely used.

It is based on four, peer reviewed Gateways before contract award and two subsequent Gateways looking at service implementation and confirmation of the operational benefits. It is a process designed to improve appraisal and project management, but interacts at a few points with evaluation as covered in this Guide.

Gateway Reviews 0 (Strategic Assessment) and 1 (Business Justification) have no evaluation component, nor would this be expected, although the Gateway Review 1 does include ensuring that the "intended outcomes, timescale and impact of relevant external issues have been considered", so building the basis for a later evaluation counterfactual. Gateway Review 2 (Procurement Approach) similarly includes confirmation that appropriate project performance measures and tools are being used. Gateway Review 3 (Investment Decision), after the receipt of proposals or tenders, ensures among other things that management controls and sufficient support are in place through to project completion.

The next Gateway, Gateway Review 4 (Readiness for Service), shortly before the service enters operation, includes ensuring a basis for evaluating ongoing performance and a check that lessons for future projects are identified and recorded, presumably by some process evaluation of the procedures up to that time.

The final Gateway, Gateway Review 5 (Benefits Evaluation, described sometimes in the 4Ps process as "Benefits Realisation"), is held "6-12 months after completion of the assets, when evidence of the in-service benefits is available". For long term contracts such as PFI contracts this Review is repeated every 3 years in accordance with planned project reviews. This Gateway is not a post-implementation review; it takes place after a post-implementation review or similar major review [and] makes use of findings from that internal review. It also expects to draw upon an updated business case that reflects actual operating conditions, baselined against the business case in Gateway Review 4. Its purposes

⁹ Although 4Ps acronym still formally stands for Public Private Partnerships Programme [for local authorities], the organisation now presents itself as "local government's project delivery specialist [working] in partnership with all local authorities to secure funding and accelerate the development, procurement and implementation of PFI schemes, public private partnerships, complex projects and programmes". The Gateway Reviews are well summarised in the "Gateway Briefing Documents" available at <http://www.4ps.gov.uk/Portal/Default.aspx?tabid=113>

include assessing whether the business case justification for the project at Gateway Review 3 was realistic, which has features in common with a value for money evaluation, but this is not the Gateway's purpose. It is aimed at ensuring that proper controls and resources are in place for the future course of the project in hand. For scheme evaluation it is the business case confirmed at Gateway Review 2, at the stage of approval to go to tender, that will normally be the main counterfactual.

The Gateway Reviews may therefore provide important material for evaluation, especially for process evaluation. However, being focused on the immediate management requirements of the project in hand, they do not require any evaluation as covered in this Guide (except some process evaluation for Gateway Review 4); nor do they require planning of and initial data collection for evaluation in the early stages, before and following grant approval. These requirements are additional to those of the Gateway Reviews.

3. Preparing and Managing an Evaluation

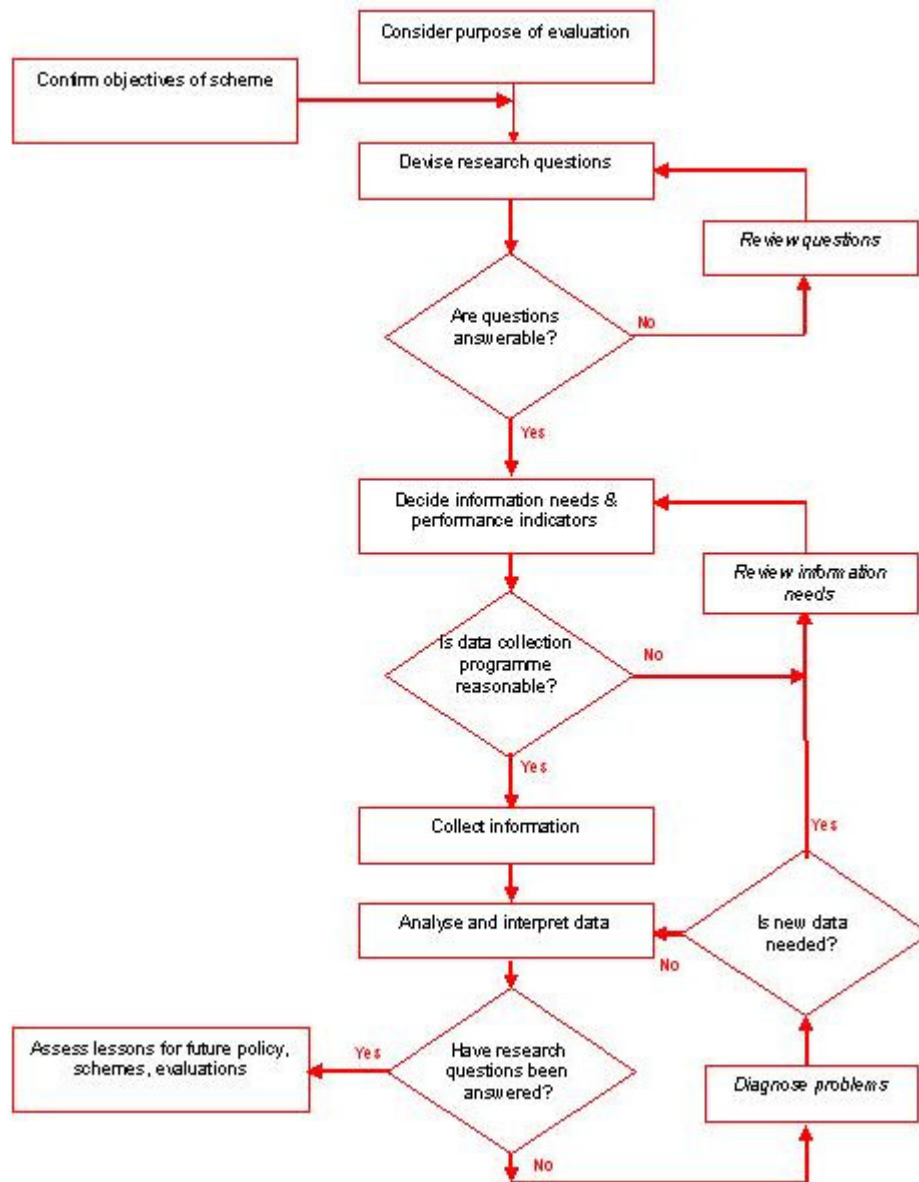
- *Advance planning to determine the purpose and scope of the evaluation*
- *Evaluation design, common pitfalls and overview of data sources*
- *Management structure for an evaluation*
- *Terms of Reference, tendering and management of an evaluation contract*

3.1 Advance Planning

The planning of the evaluation should start early in the development of the scheme itself, so that decisions can be made on the purpose of the evaluation and the data that need to be collected both "Before" and "After" implementation.

The key steps are shown in Figure 3.1, though additional tasks may arise in response to local needs and circumstances. For example, there may be advantages to out-sourcing part or all of the evaluation and so procurement activity will need to be included. These steps may be carried out over a period of years and it will help to keep an *audit trail* of major events and decisions taken to inform a process evaluation or explain some of the outputs and outcomes of an impact evaluation.

Figure 3.1
Key Steps in an Evaluation



3.1.1 Deciding the Purpose of an Evaluation

The value of evaluation lies as much in the questions that are asked as in the results that follow. The evaluation must be useful, in that it confirms the case for having invested in a particular transport solution, contributes to our wider understanding of scheme impacts, or informs our planning processes and procedures.

Different stakeholders, for example, policy makers, senior executives, local authority officers and the public have different expectations. If a major area of legitimate interest is ignored, this is likely to weaken the evaluation, either because it will be incomplete or because the results will lack credibility.

Therefore the evaluation manager may need to consult in order to clarify the purpose of the evaluation. Three key questions need to be asked before proceeding with the planning stage:

- Why are we doing an evaluation?
- What do we want to get out of it?
- How will the results improve the current situation?

If there is no positive answer to these questions, then the need for the evaluation should be reconsidered.

If there is a clear need, then more questions need to be answered to determine the scope and type of evaluation to be done:

- What aspects of the scheme are of interest?
- How can we measure success?

It may be difficult to define the scope; areas of interest can change through the course of a study and stakeholders often want to examine everything! Clearly some limits are necessary in order to manage the work and reach conclusions within practical constraints like time and resources. At the very least, consideration should be given to the institutional, temporal, sectoral and geographical dimensions. As mentioned in the previous chapter, there are two main types of evaluation relevant to major schemes; process and impact. It may be that the areas of interest fall neatly into one of these types, but a combination of the two may be needed.

3.1.1.1 Impact evaluation

Impact evaluation examines the effects of a scheme, drawing on data collected from well before through to some time after opening. This is often done for accountability to an external audience to demonstrate policy effectiveness (and should include the assessment of costs and hence value for money).

It is important to be clear about the *scheme* objectives, and for decisions then to be made about the scope of the evaluation. The evaluation might measure a wide range of indicators covering all the objectives, or focus on one or two objectives with a limited number of indicators such as patronage and journey times. It might consider the impacts on everyone in a prescribed area, or just consider a particular demographic or social group.

3.1.1.2 Process evaluation

To examine aspects of the development, funding, or implementation of the scheme, *process evaluation* may be undertaken prior to or post-opening. This should provide mainly internal information that will inform future management functions.

Decisions are needed in this case on what to investigate, who has an interest in the findings, and how they will be used. Performance indicators may be useful in the analysis, but most of the information collected will usually be qualitative descriptions of activities, and stakeholder opinions.

3.1.1.3 Combined impact and process evaluation

In practice, the results from both process and impact evaluation may be needed to provide a satisfactory picture of value for money. For example, an impact evaluation may be followed by some elements of process evaluation to explain any substantial differences in forecasts and outturns.

3.2 Evaluation Design

Evaluation design describes the indicators that will be used to describe and measure inputs, outputs and outcomes, and the methodologies used to collect and then analyse and interpret this information. The volume of work involved should be proportionate to the type and complexity of the scheme and should balance desirability with feasibility within the resources and timescale available.

The main steps are discussed in turn in sections 3.3.1 to 3.3.3, followed by a brief discussion of risks to be considered. There is no single approach to evaluation design and two examples are given in the panel. Generally it is best to minimise the number of indicators used, and to use proven techniques, or a mix of complementary techniques, so that the strengths of one offset the limitations of others.¹⁰

The best starting point is to devise a set of *research questions* that need to be answered by the evaluation. Ideally, these questions should:

- correspond to a real need for information - if a question is only of interest in terms of new knowledge, without an immediate input into policy or decision-making, then it is better suited to research than evaluation.
- relate to a judgement - experience shows that a key element in the usefulness of evaluation is the provision of a statement on whether the scheme or some aspects of the scheme have been successful against pre-set criteria.

Some examples of potentially useful questions are:

- *What has been the impact on the environment?*
- *How effective have noise barriers been?*
- *How robust were the traffic model forecasts?*
- *To what extent have stakeholders engaged in the planning and design stages?*
- *What were the main factors contributing to the cost over-run?*

An assessment has to be made of whether the questions can be answered, given the available data and other resources available. The sorts of issues that to be considered include whether the timing is right for an evaluation, whether the data collected is robust enough to support the conclusions, who will use the conclusions and how.

The next step is to decide how these questions can be investigated systematically and fully.

¹⁰ Local authority schemes are diverse and authorities have their own procedures. This Guide does not therefore provide prescriptive guidance specific to particular types of scheme. However in the design of some evaluations authorities may find useful ideas in the toolkits in section 4.2 of the OXERA paper on Highways evaluation listed in the Bibliography. These cover, from a Highways perspective, Environment, Safety, Economy and Society.

In an ideal world, the implementation of a scheme will generate a number of effects and an impact evaluation would demonstrate that these are caused by the scheme. However, in reality, many external factors may also have had an influence and need to be considered very carefully.

Suppose for example that the introduction of a light rail (LRT) scheme is followed by a reduction in traffic and hence road congestion. To what extent is this attributable to the scheme? The scheme could have opened at the same time as parking fees were increased and the evaluation will have to consider the contribution of both interventions.

Or suppose road traffic levels in the LRT corridor continue to grow. Does that imply that the scheme is a failure? Background growth in the economy may have contributed to an increase in total trip making to the city centre, and new motorists may have replaced those transferring to the scheme.

The performance of a scheme can only be measured against an understanding of *what would have happened in its absence*. It is often difficult to estimate this "counterfactual", especially for impact evaluation, and further information is given in Chapter 4.

3.2.1 Choice of performance indicators

If the evaluation is being undertaken for accountability purposes, the choice of performance indicators needs to be based on a clear understanding of the objectives of the scheme itself. Indeed the early planning of an impact evaluation may include confirming more clearly the rationale for the scheme. Scheme objectives, and how they relate to wider national policy objectives, are discussed in Appendix A.

The scheme objectives, to have satisfied the appraisal requirements and gained funding, will have nested within the higher order government objectives. However, it may be necessary to confirm the scheme objectives and clarify their original meaning before planning an evaluation.

Scheme objectives can be expressed operationally in terms of:

- **Outputs** - tangible effects that are funded and produced directly as a result of scheme; and
- **Outcomes** - final impacts, such as travel demand and socio-economic effects brought about by the scheme, in the short, medium and long term.

Scheme objectives should take account of the local context. For example, if a road passes through both urban and rural areas, traffic conditions in the two areas are likely to differ. A good objective would take account of the differences, rather than simply specifying an average expected change.

The quantities chosen to define these scheme objectives, and against which the scheme may subsequently be evaluated, should describe the effects of the scheme, and help judgements about whether the scheme has met its objectives; whether the scheme was necessary for delivering the outputs and outcomes; and whether it was sufficient.

The effects of a scheme comprise outputs *and* outcomes. Outcomes in particular may be difficult to measure and so there may be a need for proxy indicators. For example, there is no widely accepted indicator of congestion, so average speed, or a ratio of daytime to free-flow travel rates, provide proxies.

In practice, the choice of indicators will be closely linked to the monitoring data available. An example is shown in Box 3.1.

A monitoring programme, to ensure that suitable baseline and subsequent data are available for evaluation purposes, should be established early in the development of the scheme. Where the evaluation is concerned with processes, performance indicators will be chosen to describe how and why activities were carried out, to help to determine whether the activities could have been done differently, and if this would have improved the result. For this reason, while indicators for impact evaluation tend to be quantitative, those for process evaluation are usually - though not exclusively - qualitative.

For example, a process evaluation could examine the construction stage, and include qualitative descriptions of how the contractor was engaged in the design, and how the programme was managed. It could also include quantitative measures of how the expected outturn cost and completion date changed over time, perhaps within a standard framework for comparison with other schemes.

In both impact and process evaluation, the indicators should also provide information on the factors that influence particular effects. In the process evaluation example described above, these could include the availability of staff and skills, any factors leading to delays, and stakeholders' views of the reasons for any cost or time overruns.

Box 3.1

Case Study: London Congestion Charging Evaluation

The comprehensive monitoring programme which is being used to evaluate the **London Congestion Charging Scheme** contains over 100 surveys to understand the impacts of the charge in seven areas: congestion, traffic patterns, public transport, travel behaviour, the economy, society and the environment.

Methods of primary data collection used include moving car observer surveys, automatic and classified traffic counts, counts of buses and passengers, data from the monitoring and enforcement camera, travel diaries, interviews with residents and businesses. Secondary sources include the ONS Annual Business Inquiry which shows employee jobs and business units in the charging zone and across Greater London, the Dun and Bradstreet commercial database of businesses which is generated by Companies House and Thomson Directories and shows business turnover and profit, and the Investment Property Databank's analysis of property prices.

The key indicators are:

Congestion, measured in terms of the difference in travel rate (the time taken to travel 1 km) between congested and free-flow conditions;

- speed distribution (the proportion of time spent driving in particular speed bands);
- traffic volumes and density (vehicles per km on parts of the road network)
- public transport patronage, speed, and the proportion of scheduled mileage not operated (often for reasons of congestion)
- modal share;
- business impacts including how the business community perceives congestion charging and responds to it through various mechanism including changes in employment, number of business, turnover, profitability and property prices;
- social impacts including perceptions of change in the local environment, transport provision and the level of charge derived from household surveys of those living inside the zone and inner London, with individual surveys of those living in outer London and beyond the M25; and
- environmental impacts using the London Atmospheric Emission Inventory to track nitrogen dioxide and particulates, which are the two pollutants of greatest concern, and other emissions, plus ambient noise surveys at selected sites and on-street interview to understand how Londoners perceive changes in environmental quality.

Further information is available in the annual monitoring report at www.tfl.gov.uk/tfl/cclondon/cc_publications-library.shtml#reports

3.2.2 *Data collection and sources*

3.2.2.1 *Data collection*

For process evaluation, data collection is generally confined to the study of scheme documents and discussions with those involved in the implementation of the scheme, as discussed in Chapter 5. Data sources for project impacts are much more diverse and complex and are discussed in Chapter 4 and Appendix B. The main methods of data collection are:

- Surveys;
- Desk studies;
- Focus groups and in-depth interviews;
- Manual observation; and
- Automated counts.

Surveys collect quantitative information from a large number of respondents and are useful for making comparisons across time, geographical areas, and different types of respondents. The sampling is crucial to attaining statistically accurate results that reflect the local population, and questions to participants need to be considered carefully to avoid systematic response biases. An example of the use of surveys is shown in Box 3.2; and of the importance of timing in Box 3.3. Surveys of trip making can be very expensive, which makes it especially important to ensure that they will provide what is needed before they are commissioned. This can involve in-depth statistical work or some form of modelling approach. "Volumetric" surveys, such as manual classified traffic counts, are however generally much less costly.

Desk studies can be useful in gathering background information or data that could support wider analysis of issues relevant to an evaluation. Some sources are noted in section 3.3.2.2 below. A review of the scheme documentation can give an insight into the evolution of the scheme and the activities involved. However such a review is unlikely to be comprehensive and there will be a need for contextualisation and clarification from those involved at the time using qualitative research techniques.

Focus groups and in-depth interviews are useful in examining decision-making processes and can help to explain attitudes and behaviours. They are often used to explain the data collected in surveys and counts, and investigate perceptions of change brought about by the scheme. In the interests of accountability, many evaluation designs include research amongst stakeholder organisations that have a direct interest in the scheme, such as development agencies, economic fora, and pressure groups. Care is needed to ensure that the evaluation is not based on anecdote, assertion, hearsay, or other weak foundations, or biased by a lack of knowledge or by individual allegiance.

If the evaluation is intended to contribute to a debate amongst stakeholders, more advanced methods of qualitative research may be appropriate, such as a **Delphi survey** (see Glossary).

Manual observations are widely used to collect information on traffic flows and vehicle composition, journey times/speeds, parking supply and utilisation, and passenger counts. However, as with most forms of surveys and qualitative research, the costs are high, so greater use is being made of technology to reduce the time spent collecting, cleaning and coding data.

Automated traffic counts, automatic number plate recognition (ANPR) systems, automated public transport counts using microwave technology, weight sensors and passenger revenue collection systems may provide relevant data to support indicators used in impact evaluation, although privacy issues can be a constraint on the use of ANPR.

Box 3.2

Case Study: Okehampton By-Pass Evaluation

The evaluation of the controversial **A30 Okehampton Bypass** in Dartmoor National Park considers the accuracy of the environmental forecasts and the extent to which local residents' aspirations have been fulfilled by the long awaited opening of the road in 1989.

The environmental impacts anticipated at the time of the Public Inquiry were based on qualitative descriptions of the likely effect on the landscape, the appearance of structure, ecology, archaeology, agriculture and geology, and estimates of future noise and air quality (using levels of lead as a proxy indicator) were derived from the forecast traffic flows. The evaluation compares these with the findings from more recent site visits, assessments of the ecological and other impacts, and noise measurements. No post-opening air quality monitoring has been done because the reduction of lead in petrol and stricter European Commission emission limits has meant that lead levels would have fallen with or without the bypass.

Home interviews of 45 minutes were held with 200 local residents who were over the age of 25 and had lived in the town for more than 5 years. Interviewers targeted one house in seven in the majority of streets in Okehampton, and one in three in areas close to the bypass. The questions covered:

the need for the bypass;

public consultation process;

the perceived impact on residents along the old A30 and pedestrians in the town centre; and

the impacts on motorists and traffic flows, trade and development, and recreational activity in surrounding areas.

The sample size ensured that the confidence interval of responses is no more than +/-7 percentage points and the basic analysis of the findings indicated clear support for the bypass.

Further information is contained in the *Impact of the Okehampton Bypass*, TRL Report 268.

Box 3.3

Case Study: Sheffield Supertram Evaluation

A major study was commissioned to evaluate the impacts of the Sheffield Supertram scheme. However the timing of the commission meant that there was an overlap between the Before data collection stage and the preliminary works for the project. The works had a significant impact on traffic and bus operations and this impacted on the quality of trip data collected. The works also adversely affected public attitudes to the scheme, and this is thought to have influenced some aspects of the qualitative data collected.

3.2.2.2 Data sources

There is a wealth of information available that can be relevant to an evaluation. Sources include:

- Census and other national statistics such as the National Travel Survey;
- National traffic monitoring and rail operator performance;
- Local Transport Plan and travel plan monitoring;
- Revenue collection systems such as public transport tickets, parking data and road user charging data;
- Police data on accidents and incidents;
- Chambers of Commerce;
- Local Agenda 21; and
- Developer and planning data sources, as described in Appendix B, section B.5.

An example of the use of such data sources is shown in Box 3.4.

Box 3.4

Case Study: Skye Bridge Socioeconomic Impact Study

The **Skye Bridge** Socioeconomic Impact Evaluation looks at the changes brought about by the opening of the tolled bridge in 1995. The purpose of the evaluation was to test 10 hypotheses concerned the impact on tourists, business, residents and traffic using data from traffic counts and a range of surveys with visitors drivers and public transport users, local businesses and households, and coach tour operators. These are backed up by hard data from the Census of Population, NOMIS Census of Employment, unemployment, and the Scottish Hotel Occupancy Survey.

See www.scotland.gov.uk/deleted/library2/doc16/sbse-01.asp

3.2.3 Methods of analysis

The information collected for impact evaluation is normally analysed by the use of one or more of the following methods:

- Statistical techniques;
- Models;
- Qualitative mapping; and
- Multi-criteria analysis.

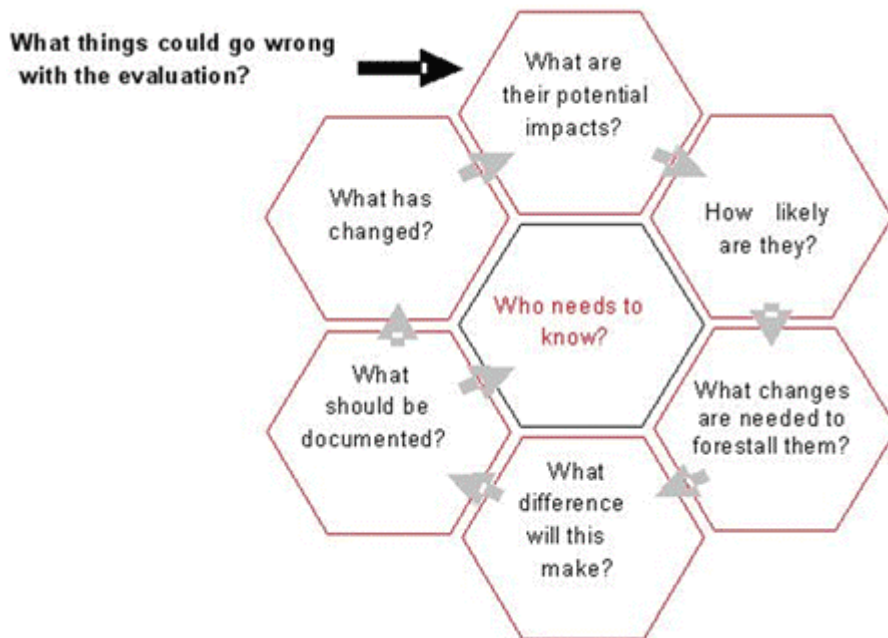
Each of these is discussed further in Chapter 4. Some of these techniques may also be used in process evaluation although, as explained in Chapter 5, process evaluation is generally more descriptive and heavily customised.

It may help, for any evaluation, to develop a work plan that breaks down the analysis into manageable component tasks, with an associated timetable and distributed budget.

3.2.4 Risk assessment

A good evaluation design will incorporate an assessment of the risks to the execution of the evaluation. Thinking through the consequences of an unexpected event, on the lines illustrated in Figure 3.2, and developing a contingency plan can help to reduce the time spent fire-fighting and help to ensure the robustness of the methodology. Some common pitfalls of evaluation are listed in Box 3.5.

Figure 3.2
Planning for the Unexpected



Box 3.5

Common Pitfalls of Evaluation

- Failure to understand the objectives of the scheme.
- Starting too late.
- Failure to agree the purpose or purposes of the evaluation (between evaluation manager and evaluation contractor).
- Failure to understand limitations of the data sources for answering the questions posed for the evaluation.
- Poor or disrupted planning, because of insufficient time and resources, too low a management priority, or inadequate response to unforeseen events.
- Failure to interpret the results of evaluation and to present them in a way which "tells a story".

3.3 The Resources Required for Evaluation

The appropriate effort for planning and executing an evaluation will vary widely from scheme to scheme. The following factors should be considered:

- Scale and nature of the scheme;
- Relative importance of the various scheme and evaluation objectives;
- Anticipated complexity of the scheme's processes and impacts;
- Data availability and scope for transfer of findings to other schemes; and
- Resources available (staff, skills, time and cost).

Clearly there will be more interest from the DfT and other authorities in more innovative schemes such as major bus priority measures, more controversial schemes (e.g. road user charging, park and ride), and more expensive schemes (e.g. light rail). If the scheme is particularly innovative, or if the findings are transferable to many other areas, a more comprehensive and/or complex evaluation design is more likely to be chosen. If a scheme is of a well established kind, and in its initial stages is displaying no markedly unusual features, the need for impact evaluation may be very light, with a basic examination of key indicators and no need for examination of wider impacts.

There is therefore no firm, general rule as to how much should be spent on evaluation, beyond the principle that this should be addressed while the scheme is being planned, to establish the scope of the work that will be required. An EU Guidance document suggests that the overall budget for all evaluation activities throughout the lifetime of a *programme* might for most services be approximately 0.5 per cent of the programme budget.¹¹ In the Highways Agency, in contrast, the standard budget for evaluation is 0.1 per cent of the scheme capital cost plus £10,000. For local authority transport Major Schemes, evaluation budgets typically range between 0.5 and 1 per cent of the scheme capital budget which implies that for a scheme costing £10m evaluation should cost less than £100,000.

¹¹ Section 4.2.6 of Evaluation of Community Expenditure - The Commission's Communication 1996: "Concrete steps towards best practice across the Commission", adopted by the Commission on 8 May 1996, (PV (96) 1292 point VII.D page 17) SEC 96/659 final.
http://europa.eu.int/comm/budget/evaluation/communications/communication96_en.htm

3.4 Management Structure for an Evaluation

Management of an evaluation requires clear identification of roles and responsibilities.

3.4.1 The evaluation manager

The first step in establishing the management structure for an evaluation is the identification of an evaluation manager, who will be the lead person responsible for the work. He or she will need to command the resources and influence necessary to deliver the evaluation, which will be a significant project in its own right. Hence the evaluation manager should be of project manager or team leader status, with relevant skills and experience of appraisal or review processes. Ideally he or she will have some reasonable knowledge of the project being evaluated, but it can be an advantage for the person *not* to be or have been engaged actively in the project. Those who have been closely involved with project development and delivery are very likely to have a degree of personal involvement and commitment that could lead to bias, either explicit or implicit.

3.4.2 The management team

The evaluation manager will need to consider who else needs to be involved in the management of the study. It may be appropriate to create a Steering Group of people with legitimate interest, skill, or influence to advise on the conduct of the evaluation. These people might include local authority members, officers from other departments in the authority, officers from other agencies or organisations, representatives of voluntary or special interest groups and academic advisers. For some important or innovative schemes, DfT may wish to be represented on the evaluation Steering Group.

There can be no hard and fast rules about the membership or remit of such a group, which must depend on the circumstances. But it is often better to involve people at an early stage as part of a commissioning advisory group, rather than encounter criticism at a later date for matters that have not been addressed within the study. A clear remit for this group should be set, in particular establish clearly the role of the group, when it will meet and the powers it will have (e.g. advisory, not executive).

Such an advisory group can also be helpful in gaining access to data and information held by others, and other agencies may even wish to provide additional resource, either in finance or in kind, when their interest is significant. The Steering Group may also play a role in defining the scope of the evaluation and selecting the evaluation consultants (where appropriate). Full membership of the steering group should be limited to those with strong involvement or interest and who can contribute relevant advice during the conduct of the work. They will need to give a commitment to continued participation, as changes in membership can be disruptive and will reduce the effectiveness of the group. Others with a more general interest can be provided with links to the evaluation through a consultative forum, or even a website. Consultation processes are required for many local authority activities and, wherever possible, established means of consultation with neighbouring authorities, interested parties and community groups should be used, rather than creating new approaches specifically for the evaluation study.

3.4.3 Providers of data

It will be necessary to identify all those people, either within the local authority or externally, who hold relevant data, material or experience that should be considered within the evaluation programme. These sources of information (such as holders of traffic counts, population and employment data, public attitude survey results) may be working in several different parts of the local authority, in neighbouring authorities or in other public or private agencies (e.g. data on health, education, air quality, biodiversity, etc.). A database should be established to record contact details and the nature of the data or information held and whether co-operation with the evaluation has been established. It may be appropriate for some of these organisations to be represented on the Steering Group.

3.5 Drawing up Terms of Reference for an Evaluation

The evaluation manager will need to understand the resources available and the timescales, including a target date for completion of the work. Resources may be expressed either as a financial budget or as staff availability or both and will include the time of the evaluation manager.

Having established staff time and other budget resources, the evaluation manager will need to consider whether the study can and should be conducted in-house or should be outsourced.

The following sections are drafted in terms of competitive tendering and outsourcing to contractors. However, many of these steps would be good practice for managing the work of an in-house team.

The evaluation manager will need to define the Terms of Reference for the evaluation. This means determining the purpose of the evaluation and an indication of the scope of the work required. This is likely to include the following steps:

- Identifying the areas of interest to be covered by the evaluation;
- Setting out the evaluation design (i.e. the approach to data collection, and the methods to be used for analysis);
- Establishing criteria for assessing the quality of the evaluation (acceptable confidence intervals, clarity of reporting, etc) ;
- Identifying available information sources;
- Establishing a work plan; and
- Selecting the evaluation team.

At this stage, the overall scope of the evaluation must be determined to at least an outline stage, in order to allow external contractors to understand the services they are being asked to provide. But in some cases the evaluation manager may only set out the basic requirements, to encourage the prospective contractors to add value by suggesting their own approach, proposed methods and workplan.

It has to be recognised that the effort that tenderers will put into proposing new approaches or methods will depend in part on the expected value of the contract. Since in many cases the evaluation could range from the primitive to the sophisticated, it will be important to give either an indication of the budget available or a clear and detailed specification of the breadth and depth of work required.

3.6 Tendering and Selection

Bidders should usually be asked to outline their approach to the issue and their proposed methodologies for data collection and analysis. The submissions can be limited to a particular length requirement (say 20 pages) where the commissioning organisation wishes to avoid excessively dissimilar bids. Bidders will also expect to give a proposed fee and provide CVs for the staff proposed to be used on the evaluation, with emphasis on previous experience on similar or related tasks.

The tender documents should set out the criteria to be used for selection and may even provide a weighting between the different elements under consideration (e.g. approach 25 per cent, methodology 25 per cent staff, 20 per cent, and price 30 per cent).¹²

For some evaluations, authorities may wish to see consortia of contractors with specialist sub-contractors for work on particular topics, for example on biodiversity impacts. In some cases, joint working with academic institutions may be encouraged through the invitation to tender.

¹² Although care is needed with such a procedure that the scoring and weighting methods are consistent and give unbiased comparisons of marginal differences in different elements.

3.7 Managing the Evaluation Contract

This section again assumes that an external contractor will undertake the evaluation. But similar steps, with a less formal approach, will be necessary if the evaluation is being carried out in-house.

Having selected a contractor, following normal good practice for any contract of this kind, an initial ("kick-off") meeting should be arranged at which the evaluation manager and the contractor's evaluation team leader agree the procedures for managing the study. While some outline will have been included in the contractor's proposal, this is the opportunity to refine and elaborate on the precise content of the work and the processes and timetable. This is also the point at which Steering Group membership and remit can be determined or confirmed, and a programme of progress reporting specified. In some cases, contractor staff will work at the authority's premises and appropriate arrangements will need to be made. Any further detailed information on data and information sources needs to be made available to the evaluation team. Thereafter, requirements for a success include the following.

- **Working relationships:** There are alternative models for managing projects of all kinds, but establishing a good working relationship between the evaluation manager and the evaluation team leader is always important. For some projects the evaluation manager may become an integral part of the team and work closely with the consultants' staff. This can be very successful in producing high quality joint work, but issues of accountability for work need to be clearly specified. For others there will be a clear separation of tasks between client and contractor.
- **Progress keeping:** It is good practice to establish clearly the intermediate steps at which progress will be reported and the nature of the "deliverables" that will be provided at each of these steps. For some highly detailed or particularly complex projects, frequent progress meetings will be required, so that the evaluation manager is kept up-to-date with progress and any necessary programme changes identified and future work plans amended accordingly. For others the evaluation team may work for some time (e.g. on data compilation) before a progress meeting will become relevant.
- **Responding to change:** Events or circumstances virtually always change during the conduct of the study. To handle this, arrangements for managing the work must be both transparent (so others can understand progress) and robust (to be able to accommodate changes in personnel, timescales and even scope). A good working relationship should ensure sensible recognition of any difficulties encountered in carrying out agreed tasks and joint recognition of how best to proceed in the face of any problems.

3.8 Presentation of the Final Report

The usefulness of all the work put into an evaluation depends not only on its technical quality, but also on the presentational quality of the final report, in terms of clarity and appropriateness to the specific purposes and potential users of the work. Further information on reporting is given in Chapter 6.

4. Impact Evaluation

- *Purpose and scoping an impact evaluation*
- *Timing of impact evaluation*
- *Developing the counterfactual*
- *Data collection and analysis techniques*

4.1 Getting Started

4.1.1 Purpose of impact evaluation

An impact evaluation follows a logical sequence of steps which begins with the identification of the purpose of the evaluation to inform the evaluation design.

Most general impact evaluations are carried out for accountability reasons; they demonstrate the extent to which the project has met the objectives set for it at the appraisal stage. Hence it is crucial that the scheme objectives are fully understood.

Government high level objectives, shared priorities and Local Transport Plan objectives tend to provide the framework for major scheme objectives, though the latter often have a more localised flavour. The anticipated impacts are usually recorded in an Appraisal Summary Table (AST) which provides a useful checklist for an evaluation (see Appendix A).

There is a danger that some of the important impacts of a scheme may not be covered by the stated objectives. For example, improved accessibility is a Government objective, but may not be a specific objective of a new orbital road. In fact, the scheme may have adverse consequences on accessibility by encouraging more car use and these issues should be considered in the evaluation, if they are material. An evaluation should normally include an assessment of overall value for money. This implies an analysis of *costs* and *timescales*, and a comparison with estimates made at the time of scheme approval on which the DfT or other organisations agreed to provide funding.

In addition to accountability, impact evaluation may be used to identify ways of improving forecasting and appraisal techniques. Data on travel demand and travel costs - time and money - for conditions Before and After scheme opening provides a firm base from which to estimate new models for travel demand forecasting, or improve our understanding of phenomena such as induced traffic.

4.1.2 Thematic impact evaluation

A general impact evaluation carried out for accountability purposes may include a special focus on selected themes, with a view to meeting a clear demand for information to help with the further development of the scheme being evaluated or future similar schemes.

For example, in developing evaluation proposals for Manchester Metrolink Phase III it was considered worthwhile including the impact of the scheme on bus operations. Impacts on bus operators are of interest if, for example, a new LRT results in an area-wide decline in bus service quality that impacts on accessibility. This illustrates how concerns about specific themes often nest within higher level objectives.

4.2 When to do Impact Evaluation

Baseline data needs to be collected before any preliminary works begin on site, as traffic disruption and changes to public transport services may affect travel behaviour and attitudes towards the scheme.

There is some flexibility in when to collect After data and do an evaluation:

- **Settling Down Period** - About a year after initial opening when significant changes in demand are underway as the public gradually becomes aware of the existence of the new facility. Similarly, the facility itself may evolve, for example, as the frequency of a new public transport service increases as more drivers are trained and new vehicles are delivered.
- **After Short Term** - The period during which awareness of the scheme has stabilised, but when short term behavioural responses (e.g. changes of route, direct changes of mode and changes in timing of peak journeys) predominate. This is typically extends over one to three years after opening.
- **After Medium Term** - The period during which all of the longer term transport responses (e.g. changes of work location) and shorter term land-use/demographic responses are likely to occur. This typically extends over three to seven years after opening.
- **After Long Term** - The period during which the scheme is fully established and most of its impacts have had sufficient time to work through. Long term impacts are particularly associated with development location, business location and the housing decisions of individuals, local authorities, landlords and builders.

Large schemes are often implemented in phases and so a choice has to be made as to whether individual phases should be evaluated, or an evaluation should be postponed until the last stage opens.

Evaluation of individual phases raises significant complications. As an example, a segregated busway scheme consisting of three routes could be opened in three separate phases, with gaps of about ten months between each opening. The routes may serve separate corridors, but as each line opens, the network impacts will build up and exceed those of the individual routes. By the opening of Line Three, Line One will still be in the After-Short-Term stage as defined above, and so its impacts will not have stabilised and observations will be distorted by the impacts of the other two lines.

Impact evaluation of individual phases is thus most likely to be warranted where:

- the individual scheme components are very large and geographically separated;
- construction and implementation of the phases are in sequence rather than in parallel; and
- there is particular interest in studying the process by which travellers become aware of the scheme and begin to make use of it.

4.3 Impact Evaluation Design

4.3.1 *The counterfactual*

Impact evaluation involves comparing the observed outputs and outcomes with a reference case. The analysis needs to look at the After opening situation against After-Without the scheme. While this is intuitively obvious, and crucial, it raises difficult issues; the After-Without situation is not observable and it is not the same as the Before situation.

The After-Without case, on which all evaluation work is founded, is generally termed the counterfactual. With large transport schemes the construction and settling down periods can extend over a number of years, and much can happen in that period. However, without an unambiguous picture of the counterfactual, it is impossible to disentangle and measure the impacts of the scheme (for example on congestion, or on traffic related environmental changes).

There are several approaches to defining the counterfactual. At the simplest level, this could be done by developing the After-Without case from a description of circumstances before the scheme was implemented and thinking through how this should be adjusted to allow for general trends. Some insight into the sorts of changes that have occurred and how they have impacted on transport demand and travel behaviour can be gained from data on comparable areas outside the direct influence of the

scheme. This should be supplemented by qualitative research such as depth interviews with stakeholders and relevant professionals to understand and explain the observed changes. These could be extended to consider the compatibility of the area with the scheme and its comparators, particularly to consider how similarities and differences would affect the transferability of trends and the likely reactions to change.

There is potential for over-simplification with this approach and some of the problems inherent in trying to deduce the impact of a major scheme using just count (flow) data or surveys of trip making from the Before and the After period are set out in Box 4.1. These problems would arise even if a scheme could be implemented with only minimal time between Before and After periods, but become insurmountable if there is a significant gap, with consequently substantial changes unrelated to the scheme.

Most major schemes were developed and appraised with the assistance of some form of transport model and there are advantages of returning to this to estimate the counterfactual from the do-minimum forecast.

This pre-supposes that outputs from the earlier modelling work remain robust. However, experience suggests that there is often a considerable difference between the forecast made for the scheme and the observed outturn. This casts doubt on the validity of the do-minimum forecasts and hence their use for estimating the counterfactual.

Box 4.1
Modelling the Impacts of a Transport Scheme

Suppose that we could be certain that change of destination was not an issue, and that the only changes in demand to be expected in response to a scheme were in frequency, mode, and time of travel. We could then analyse the scheme impact largely on the basis of counts on appropriate screenlines.

Summing over all modes and times, we can demonstrate any overall change in the number of trips, or trip frequency. Summing over time within mode, and over each mode within time of day, can reveal changes by time period and by mode. However this does not explain what has caused these changes. They could reflect for example a growth in commuting trips and a fall in shopping trips. The time of day shift could be entirely responsible for the change in mode, because the quality, and hence share, of public transport varies with time of day.

Disentangling the contributory factors behind a change in travel flows is complex. Even at the aggregate level described here, we require some notion of model structure to analyse the separate effects. The standard modelling approach is to assume that the various responses to a change in the time/money costs of travel can be arranged in a hierarchy. For example, for commuting a change of time of travel might be very unlikely (it is "insensitive") whereas a change of mode might be a distinct possibility (be more "sensitive"). For shopping the opposite may be the case. The interpretation of a time of day shift depends on whether we assume it is driven by mode choice, or vice versa.

In any case, once we admit the possibility of a change of destination, counts alone are completely inadequate. We now require data build a trip matrix, not only for those origin-destination (OD) pairs directly affected by the scheme, but also to cover a reasonable range of substitute OD pairs.

Thus, while it may be possible to deduce gross effects simply from survey data (e.g. by aggregation to the point where issues such as re-distribution of trips are not relevant), disentangling the importance of the various responses to a scheme can often only be achieved by fitting a model to the Before and After data.

The main weakness often relates to the planning assumptions that were assumed at the time of the appraisal (e.g. population location, new developments, stability for existing activities). The applicability of the do-minimum can be improved through re-running the model with updated

planning data, and updated transport networks, that better reflect the outturn in the After period. However, this will require considerable care, not least because the scheme itself may have influenced planning decisions and transport networks (beyond the scheme itself) and this cannot, by this approach, be objectively assessed.

In addition, the approach will only be of value if the specification of the appraisal model was sufficiently comprehensive. For example, the do-minimum case may have only included committed schemes and other initiatives have been implemented, and the forecasting process may not have specific processes for dealing with destination choice or change of main mode in response to changes in travel costs. In these circumstances it may be more appropriate to update the base-year appraisal model outputs on the basis of observed trends, rather than undertaking new model-based forecasting work. A further potential opportunity that should be investigated is provided by any model updating work or new model construction undertaken since the appraisal work was completed.

The third approach is to calibrate a new forecasting model from Before and After data sets. This is most appropriate where:

- the existing appraisal model is felt to be quite weak in scope and accuracy, and is not therefore suitable for use in the evaluation; and
- it is felt that existing forecasting techniques for the type of scheme being evaluated are weak, and there would be an opportunity to improve them through analysis of the scheme under consideration.

Model calibration is however complex, as indeed is any comprehensive transport demand modelling, because it needs to capture such a wide variety of factors, and to filter out noise in the data.

4.3.2 Establishing the analytical framework

The analytical framework for an impact evaluation needs to be set up at an early stage, as this is then used to define the data collection activities. Data collection is often a very expensive process. Whilst it may be desirable in principle to collect a very wide variety of data, gain an understanding of it, and then decide on an analytical framework, this is not generally practical.

While collecting data on everything that is potentially relevant is impractical, restricted data collection programmes that are not explicitly targeted run the risk of excluding an item that is crucial for the analytical approach ultimately adopted. Similarly, any requirement for the building and use of models (transport or land-use) needs to be clarified at an early stage, as again these are time consuming and expensive to create.

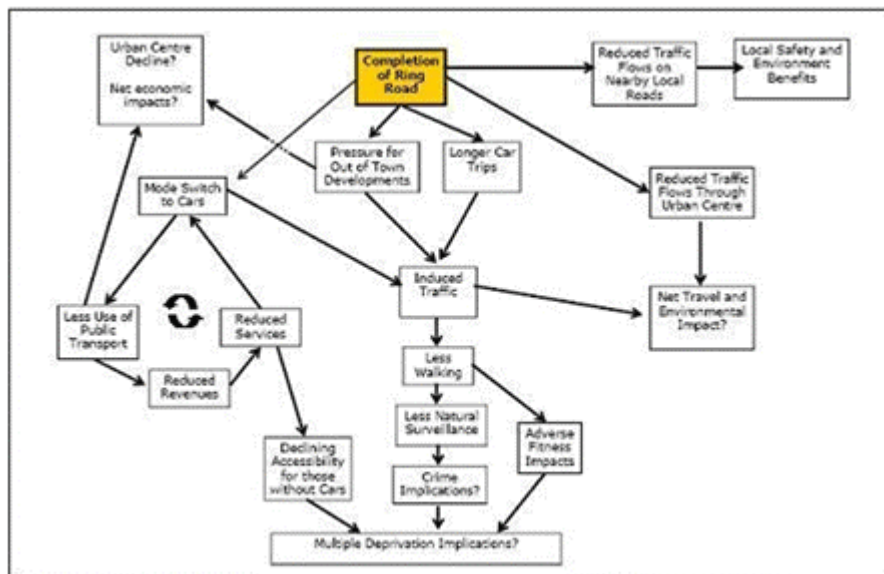
A good practice in defining the analytical framework is therefore to create a causal chain diagram, or set of diagrams, which explore the potential scheme impacts. An example in Figure 4.1 explores the impacts of a scheme to complete a ring road in a medium size town. If time permits, some data could be collected speculatively in an inception phase, to confirm whether or not some of the relationships recorded in such diagrams merit detailed exploration.

With an indication of the likely impacts, it should be possible determine the magnitude of the data collection and analysis tasks. The most important questions to answer are:

- Is the evaluation limited to outturns, or is it to extend to processes?
- What should be the geographic scope and population of interest?
- How many After periods are to be explored?
- Will statistical analysis suffice for the evaluation, or are new modelling/forecasting tools required?

How to answer such questions is best explored in the context of hypothetical evaluations, as illustrated in section 4.6 below.

Figure 4.1
Causal Chains for Impacts of a New Ring Road about Four Miles from a Medium Size Town Centre



4.4 Data Collection Techniques

This section provides an overview of data collection techniques for impact evaluation. These are discussed in more depth in Appendix B under the following headings.

- General principles, covering types of traveller survey, cross sectional and longitudinal surveys, sampling and bias, choice surveys and focus groups and other qualitative surveys;
- Surveys of personal travel;
- Data collection for freight;
- Network volume and performance surveys;
- Planning and developer data;
- Environment data.

Some data that is relevant to impact evaluation will already be collected on a regular basis. Particularly important, in the context of this Guidance, are the monitoring programmes for the Local Transport Plans (LTPs) which include performance information (Item 4 in the list above).

A small number of authorities also carry out household surveys for monitoring personal travel, but these are expensive, especially compared to specifically targeted surveys, and reliant on large sample sizes to measure statistically significant changes. Further information on reliability is contained in *Monitoring personal travel for Local Transport Plans*, DfT 2002.¹³

¹³ At: http://www.dft.gov.uk/stellent/groups/dft_transstats/documents/page/dft_transstats_505582.pdf

Similarly useful, but less consistently available is local authority planning data monitoring (Item 5 in the list above). National data sets of planning data are also available, but tend to be based either on local authority estimates or on broad trends.

Evaluation managers should note that there may be difficulties in collecting patronage information in a deregulated market, or where a concessionaire is involved because of reasons of commercial confidentiality.

Environmental impacts may include noise, local air quality, greenhouse gases, landscape, townscape, heritage of historic buildings, biodiversity, water environment, physical fitness, and journey ambience. Some progress is being made on the quantitative measurement of these impacts and sometimes on assigning monetary valuations, both by the DfT and in other countries (as recorded in WebTAG announcements). For example, noise impacts can be measured through defined thresholds and changes in the numbers of people affected. Perceptions of transport can, through well-defined surveys, be measured in terms of satisfaction scores for local transport services.

At the appraisal stage a number of these impacts (noise, greenhouse gases, air quality, transport influences on physical fitness) will have been forecast, for both the scheme and the counterfactual, using transport model-based parameters such as traffic flows, speeds and composition (heavy and light vehicles). In the After scheme situation, it will be possible to observe most of these variables (especially at the more critical locations) or estimate them from directly observed data. These will be more accurate than model-based forecasts.

However, as with other variables, it will not be possible to observe what the variables would have been without the scheme. The most comprehensive approach to evaluating these impacts is therefore to:

- observe impact variables in the After period;
- "forecast" impact variables for the After period and for the counterfactual; and
- apply corrections to the counterfactual forecast, that reflect the differences between observed and forecast impact variables in the After period.

Some impacts can only be described qualitatively and it will be a matter of professional judgement as to whether the outturns are in line with expectations.

4.5 Data Analysis Techniques

4.5.1 Analysis of quantitative data

Statistical analysis techniques are most applicable to impact evaluations where extensive data sets have been created, but where a comprehensive modelling and forecasting framework, as outlined in section 4.5.3 below, is not part of the methodology. Although the validity of models raises a number of issues, once finalised their results are perforce treated as "correct". For example, the percentage change in a measure of congestion between the modelled counterfactual and the modelled After case would generally be quoted without supporting measures of statistical accuracy.

Some statistical measures and techniques applicable to impact evaluation are listed in Box 4.2 (and defined in the Glossary). This list is not comprehensive. A wide variety of statistical approaches are available, and are well documented in the extensive literature. Further detail can be found in the Cabinet Office Magenta Book. However there are many pitfalls and the support of an experienced practitioner is needed for all but the simplest applications.

Box 4.2

Selected Statistical Measures and Techniques

Measures of central tendency: mean; median; mode.

Measures of variability: variance; standard deviation; range; Normal distribution; t distribution; confidence interval.

Measures of statistical relationships between variables: covariance; regression analysis/ correlation coefficients/ hypothesis testing/ level of significance.

4.5.2 Analysis of qualitative data

Analysis of qualitative information entails the following stages:

- transcribing information from notes or electronic recordings;
- initial analysis to facilitate interpretation;
- interpretation.

Software packages, such as CAQDAS, are available for use with large surveys.

The main issues arising are the need to:

- ensure that all relevant factors are picked up by those responsible for transcribing and analysis - i.e. to ensure that nothing is missed; and
- avoid selective use of the information during interpretation in order to support a pre-defined view of the situation.

The latter problem can arise without conscious intent and skew the findings. It is often simply a result of the background and understanding of the member of staff undertaking the interpretation. A check on the process using two interpreters is often advisable.

A standard and effective method of interpreting interview data is **qualitative mapping**. This involves identifying and mapping the commonly mentioned issues and contrasting themes, with reference to a set of contextual factors such as, depending on the nature of the scheme and of the evaluation, political factors and the LTP, transport factors, local development, PTE/local authority working practices, or intra- and inter-institutional relationships.

A more complex and demanding set of decision making tools for situations that depend largely on expert judgment comes under the heading of **Multi-Criteria Analysis (MCA)**.¹⁴ Within sophisticated MCA the contributors do not have to agree on the relative importance of the criteria or the rankings of the alternatives. Each enters his or her own judgements, as a contribution to a jointly reached conclusion. However confusion can arise if a well structured process is not followed, with leadership experienced in MCA and following established conventions.

4.5.3 Modelling

Three types of modelling system are relevant to impact evaluation:

- transport models;
- land-use models; and
- land-use/transport interaction models (LUTI) models.

Models can provide estimates for impacts that are not directly observed by surveys and other data collection methods. They can also assist in estimating the counterfactual and in analysing the impacts of complex interactions.

¹⁴ The government manual on MCA is listed in the Bibliography.

No survey procedure can observe all of the impacts of a scheme. Travel surveys observe samples of the many thousands of origin to destination movements made in a study area. Similarly, journey time surveys and counts rarely if ever cover all of the transport network. Effects on congestion and the environment are very difficult to observe comprehensively across a large area. The creation of validated models for both the Before and the After period allows estimates to be made of the totality of impacts, albeit that this process is subject to a degree of modelling error.

Creation of a LUTI model expands the comprehensiveness of the data that can be captured to include demographic and development data, and so they can be used to assess wider social, economic and regeneration impacts.

Models are discussed in more detail in Appendix C. Appendix D summarises some more general aspects of the evaluation of regeneration impacts.

4.6 Illustrative Examples

Three hypothetical examples are presented here to illustrate impact evaluation:

- A light rail or (largely segregated) busway scheme for a single corridor in a large city. This is a comprehensive evaluation across all government and scheme objectives.
- A town centre bus circulation and bus station scheme. This is a partial evaluation, on the assumption that inferences can be drawn from previous comprehensive evaluations of this type of scheme.
- A real time parking guidance system implemented for a medium sized city. This is included as an example of a major scheme where more conventional transport forecasting and modelling approaches are less likely to be applicable.

For each scheme the following stages in the impact evaluation are considered:

- definition of the scheme for evaluation purposes (in particular defining what is and what is not to be evaluated);
- the relevant scheme objectives;
- impact evaluation objectives;
- evaluation timescales;
- available data sources;
 - from the scheme appraisal stage;
 - from other sources (e.g. LTP monitoring).
- analytical framework and technical approach;
- data collection requirements.

The descriptions below are written from the perspective of a requirement to plan an impact evaluation at a point arising about half way through the scheme appraisal, when progression of the scheme looks likely, but before any preliminary implementation works have begun.

4.6.1 Example 1: A Light Rail or (largely segregated) busway scheme for a single corridor in a large city

Definition of the scheme - The scheme is a line about 14 km long, running from the city centre to a business park on the urban periphery. It is the first scheme of its kind for this city. There is a large park-and-ride facility at the business park. Segregated operation is the norm, other than in the city centre, where a high degree of on street priority is provided. Stops are spaced at nearly three times the

average for bus stop spacing. There is an 80kph operating speed between stations on the segregated sections. There are no changes to the competitive bus market on opening and the local bus operators have no stake in the scheme. The scheme is to be built and operated under concession arrangements, with fares pegged to local bus rates. The concessionaire operates the scheme to a defined specification for a fixed yearly payment from the local authority, to whom all scheme revenues are paid. A city centre parking restraint policy, aimed primarily at commuters, is to be implemented over the same period as the scheme. A decision is taken that for impact evaluation purposes it will be assumed that this parking policy would have been pursued regardless of scheme approval.

Identification of the relevant scheme objectives - The stated objectives for the scheme are focused on the economy of the city centre, on general growth and on regeneration of the less successful parts of the city centre. There is also an objective to build up a regional profile for the city centre, and this is the reason for the park-and-ride component of the scheme. Important other scheme objectives, also related to the city centre economy, are reductions in road traffic congestion in the inner urban area, and a general improvement to the city's image. A specific objective beyond the city centre economy theme is to improve access to facilities for those unable to drive or obtain lifts.

Impact evaluation objectives - It is considered by the stakeholders and the DfT that a comprehensive impact evaluation is required. This is a major scheme costing more than £100m, and there is a need to understand in detail the impact against scheme and government objectives.

Evaluation timescales - The evaluation is to span from the Before period to an After point approximately three years after opening to allow for a full build up to mature demand levels. All major data collection should be within this period. Monitoring reports are expected at the end of the first and second year, with a report of the evaluation available after the end of the third year.

Available data sources - Data are potentially available from the scheme appraisal stage and from ongoing monitoring activities.

- There are travel data and a transport modelling system available from the scheme appraisal stage. However the appraisal data was collected 6+ years before the projected scheme opening date, and is considered to be too old and not adequately documented to form the basis for an impact evaluation. The appraisal modelling system consists of route choice (assignment) models for road traffic and public transport passengers, and a mode choice system addressing the split between car and public transport usage. Forecasts for the do-minimum have not taken account of traveller responses other than mode and route.
- The terms of the concession include an obligation for the operator to collect patronage, revenue and performance data for the scheme itself.
- The LTP monitoring programme observes trends in highway and public transport volumes, and journey times, for each corridor. Traffic counts are collected regularly on most significantly trafficked roads. Revenue collection based data is available for public car parks, but not from commercial bus operators (who consider the scheme to be a threat to their market).

Analytical framework and technical approach - The key considerations and decisions taken are as follows.

- It is considered that the existing travel data and/or the existing transport modelling system are not suitable for estimating the counterfactual. It is also considered inadequate to apply trend data to a picture of the Before situation (based on new data). The scheme will have a very wide impact across the city as a whole, and development/population changes across a time span of 3-4 years would distort such an analysis. This makes use of the "neutral corridor" approach to estimating the counterfactual problematic. Therefore, the evaluation design assumes that the counterfactual will be addressed through a process involving the creation of new road traffic and public transport assignment models for both the Before and the After period, and using these as the basis for calibrating a new demand model, from which the counterfactual will then be forecast.

- Land-use information for the counterfactual will be based on a "manual" process of unpicking the scheme's impacts, based on in depth qualitative surveys with developers.
- The primary estimation of scheme impact will then be through comparison of modelled representation of the After and the forecast Counterfactual situation.
- Environmental impacts will, where possible, be directly observed in both the Before and the After periods, related to relevant assignment model outputs (e.g. flows, speeds, composition) and then forecast for the counterfactual.
- As well as a clear position of scheme impacts at the After date, relative to a forecast counterfactual situation, an understanding of the details of the process by which the scheme has brought about changes in travel is also considered to be important. Such an understanding may have the potential to supplement the cross-sectional data approach to demand model creation and the forecasting of the counterfactual. A decision is therefore taken to:
 - carry out extensive, and where possible continuous, trend monitoring from the Before period to a point somewhat beyond the date of the (cross sectional) After data collection; and
 - undertake longitudinal data collection of travel behaviour over the same period.

Data collection requirements - The above definition of the analytical framework produces a requirement for the following data collection activities.

Data collection directly related to the estimation of the counterfactual

- Comprehensive road traffic and public transport origin/destination surveys covering the area of scheme influence (thought to be of the order of 50 per cent of the city area):
 - carried out to the same specification for both the Before and the After period;
 - of sufficient volume and detail to allow the creation of assignment models validated to a high standard¹⁵ with demand segmented by key demand modelling characteristics.¹⁶
- Surveys of city centre car parking supply and demand;
- Surveys of users of the scheme, including the park-and-ride component, again obtaining all of the key modelling data requirements;
- Surveys of developer attitudes and decision making in respect of the scheme; and
- Environmental impact surveys.

Data collection targeted at observing trends and the causes of travel behaviour change

- Ongoing monitoring of road traffic and public transport network performance and volumes;
- Monitoring of planning applications and physical development activity; and
- A longitudinal household panel survey, observing life changes, travel behaviour changes and changes in awareness and attitudes to transport.

4.6.2 Example 2: A town centre bus circulation and bus station scheme

Definition of the scheme - The scheme involves demolition of an existing, underutilised, central bus station, and use of this site for a key office/retail development. Construction of a new bus station will

¹⁵ For example that specified for scheme appraisal in the Design Manual for Roads and Bridges.

¹⁶ Trip purpose (a minimum of employers business, commute, other), a split between home base and non-home based, a measure of car ownership/availability).

take place on the edge of the town centre. There will be alterations to traffic management arrangements, to allow buses direct access to the new bus station from all radial routes. The scheme also involves removal of bus services and bus stops from certain streets in the heart of the town centre, permitting more retail streets to be pedestrianised. There is a five year commitment to provision of a free city centre bus distributor service (small electric vehicles, distinctive livery, high frequency, understandable routeing, clearly marked stops) with low operating speeds allowing penetration of the existing and newly pedestrianised areas.

Identification of the relevant scheme objectives - The overarching objective is to enhance the attractiveness and viability of the town centre. This is to be achieved through improvements in the town centre environment for pedestrians and through the facilitation of a major new retail/office development site. Important secondary objectives are maintenance of the connections from the radial bus system to the town centre core, and facilitation of interchange between bus services within the town centre.

Impact evaluation objectives - There is only a limited budget available for the evaluation of this scheme. The priority for the evaluation is to determine the extent to which the explicit scheme objectives have been achieved. Impacts on the wider government objectives are to be interpolated from a combination of:

- a limited number of key indicators from the current evaluation; and
- use of existing, much more detailed, evaluations of similar schemes.

Evaluation timescales - The evaluation is to span from the Before period to an After point approximately 18 months after completion of transport works, when it is expected that a development on the site of old bus station should have been completed. If the development has not occurred by this point, the evaluation is expected to explore the reasons why. The total span between the Before and After points is expected to be about 30 months.

Available data sources - The LTP monitoring programme observes trends in highway and public transport volumes, and journey times, for each corridor on the approaches to the town centre. Traffic counts are collected regularly on most significantly trafficked roads. Data from revenue collection systems is available for public car parks and from bus operators (who consider the scheme to be broadly in their interest). The scheme appraisal was based on assumptions made from the monitoring data. No specific data was collected for appraisal purposes, and no transport modelling was undertaken.

Analytical framework and technical approach - The evaluation budget does not permit a model based approach to definition of the counterfactual. The counterfactual is therefore to be estimated on the basis of travel trends in comparable towns within the same region, and from interviews with developers concerning the attractiveness of the town centre in the absence of the scheme proceeding. The analytical framework requires the identification and quantification of key indicators that are (a) relevant to the scheme objectives and (b) can be related to previous comprehensive evaluations to facilitate understanding of wider scheme impacts. Examples of the former include:

- Changes in town centre property vacancies and rents;
- Changes in town centre pedestrian footfall;
- Speed of progression of development on the old bus station site;
- Numbers of bus passengers entering the town centre;
- Numbers of bus passengers interchanging in the town centre;
- Usage of the bus distributor;
- Walk times for bus passengers from town centre alighting points to key attractors; and

- Interchange times for passengers making cross town journeys (in particular impact on walk times).

It is hoped that the scheme will greatly increase bus trip making to the town centre, and also increase numbers of cross town trips by bus. Some of this increase would involve transfer from the car and walk/cycle modes. The scale of this change needs to be understood in order to make use of outputs from previous evaluations that can give insights into impacts on key areas of interest such as congestion, traffic related environmental impact and physical fitness. Similarly, it may be possible to relate improved travel conditions for bus passengers to measures of accessibility to facilities. A quantified approach to making use of analyses from previous evaluations is desirable, but, as a minimum, general comments about the direction and scale of impacts could be made, relating the current exercise to a databank of previous work.

Data collection requirements - The definition of the analytical framework produces a requirement for the following data collection activities in the Before and After periods.

- Bus passenger counts by corridor (from the LTP monitoring);
- Passenger counts of users of the new distributor service (After period only);
- Passenger interview surveys at town centre boarding points, observing traveller characteristics and trip behaviour and seeking attitudes to relevant transport issues;
- Surveys of passenger walk times - between bus stops and a sample of key facilities, and for a sample of town centres interchange movements;
- Bus journey times to/from relevant town centre stops to notional points outside the area of scheme influence (this data is assumed to be available from the LTP monitoring);
- Traffic count and journey time data from the LTP monitoring;
- Bus operator ticketing data, by service, for a sample of neutral months between the Before and the After period;
- Town centre public parking data from ticket sales; and.
- In-depth interviews with developers and estate managers, possibly using focus group or Delphi techniques to facilitate development of a consensus about the scheme impacts (and trends without the scheme).

4.6.3 Example 3: A real time parking guidance and information (PGI) system

Definition of the scheme - The scheme consists of implementing a real time parking guidance and information (PGI) system for a medium sized city. Access to the information will be available at roadside variable message signs, on mobile phones, from local radio stations and via the internet. The real time element of the system will concentrate on providing information about car parks where space is limited and about alternative locations where plenty of spaces are available. The system will feed into the operation of the UTC system in order to ease movements into car park locations where spaces are available.

Identification of the relevant scheme objectives - The primary scheme objective is to reduce unnecessary traffic circulation and the congestion that results from this. Sub-objectives are to maintain the accessibility and relative commercial attractiveness of the city.

Impact evaluation objectives - The primary objective of the evaluation is to understand the impact of the scheme on congestion and so an estimate of any change in vehicle kilometres associated with the search for parking spaces is seen as a priority. A secondary objective is to identify any change in the perceived attractiveness of use of the town centre.

Evaluation timescales - The evaluation is to span from the Before period to an After point, approximately one year after full implementation. The implementation works are not expected to impact upon traffic operations, and so the Before period can be very close to the date of opening.

Available data sources - The LTP monitoring programme observes trends in traffic volumes and average speed. Automatic counts and floating car surveys are done regularly on the main arterials. Electronic ticket information is available for all public off-street car parks, and for on-street paid spaces, from which it is possible to identify the arrival time and length of stay. No specific data was collected for scheme appraisal purposes, and no transport modelling work was undertaken.

Analytical framework and technical approach. With respect to defining the counterfactual, the short time horizon for the evaluation - a few weeks before "switch on" to one year after instigation - means that many confounding factors, such as growth in the economy, rising car ownership and increased car use can be ignored or allowed for by application of a simple growth factor.

Whilst traffic counts and speeds are available, these will not help to identify the effects of the PGI system on congestion, as any reduction in circulating traffic can be hidden by generated trips that have been attracted by perceptions of easier accessibility, or an increase in through traffic diverting off more congested alternative routes.

Instead the overall approach would involve:

- measuring change in parking search mileage as a measure of efficiency savings;
- comparing the total demand for car parking in the Before and After situations to investigate any change in attractiveness of the urban centre in response to eased parking conditions; and
- confirming any measured change with the results of driver interviews.

Data collection requirements - The definition of the analytical framework produces a requirement for the following data:

- Before and After counts at free (but time restricted) on-street locations, and any off street locations where car park ticket machine data needs to be broken down into greater detail;
- Random face to face interviews with drivers using all the off-street and on-street parking locations in the urban centre to understand the factors that influence their choice of car park, the route taken through the city centre searching for a parking space and, for the After situation only, their awareness of the PGI system, confidence in its accuracy, and whether they had followed the advice given.

People find it difficult to estimate travel time and distance. It is therefore more accurate to ask them to describe their route and then manually estimate the difference in average search mileage for the Before and After situations. Time estimates would only be used where respondents were unable to name/describe the sequence of parking locations tried.

Survey resource and sample sizes would be governed by the need to interview at all locations. Unless all locations are investigated, the parking location migration caused by the scheme will not be observed correctly. At each location relatively small numbers of interviews would be required.

5. Process Evaluation

- *Scope of a process evaluation*
- *The main players in Local Transport Schemes*
- *Potential topics for process evaluation*
- *Process evaluation of specific activities: Questions to ask*

5.1 Scoping a Process Evaluation

A process evaluation examines the strengths and weaknesses of procedures of themselves and how they were implemented. This information is generally used internally to inform the further development of a scheme, or to draw lessons for future schemes.

This might cover the early development stages including problem identification, option testing and appraisal of the preferred scheme leading up to Programme Entry. Or it could look at the effectiveness of consultation processes in the finalisation of the design, the development of the revised business case, and/or how decisions were made on capital procurement and risk allocation prior to Conditional Approval. It might even look at tendering processes and how price changes were managed prior to gaining Full Approval.

As with impact evaluation, a process evaluation may consider a wide range of areas or be targeted at a particular issue. A *full process evaluation* is more likely to be merited where a scheme:

- is novel (technically or in terms of the "purchase vehicle");
- is abnormally large, expensive, or controversial; or
- is perceived¹⁷ as being particularly successful or unsuccessful, and process issues are thought to have contributed significantly.

Process evaluation should be carried out by independent and experienced reviewers, so that the investigation will benefit from their understanding of the issues, but the interpretation of the recommendations will not be biased towards a particular outcome. Hence the evaluation team could include individuals from parts of the promoting authority that have not been involved in the scheme, staff from outside the transport department or in some cases external contractors.

The timing of a process evaluation is flexible and depends on its purpose. Two obvious trigger points are just before the main scheme works commence (i.e. once all legal, funding and risk allocation arrangements have been substantially defined); and following the opening of the scheme, thus observing the process of scheme implementation. A two stage evaluation may minimise the potential problem of key people moving on to other employers, or documentation being lost.

5.2 The Main Players

A process evaluation may sometimes need to investigate the views or role of many players involved in developing and implementing a local authority major transport scheme. The players can be considered under eight main headings as follows.

¹⁷ Perceptions are appropriate here, as it would not be sensible to await the outcome of a full impact evaluation before considering processes, as many key players would then have moved on and much documentation would be difficult to obtain.

- **The scheme promoter:** The authority proposing the scheme (e.g. a local authority or a Passenger Transport Executive). This may be the lead authority where multiple authorities are involved. A specific officer or group of officers within the promoting authority may be in overall charge.
- **Other stakeholders:** Stakeholders can include a wide variety of individuals and groups. The most important are generally as follows (some of whom are also statutory consultees as noted separately below):
 - Promoting authorities other than the lead authority (scheme promoter);
 - Local politicians and Members of Parliament;
 - Other local authorities affected by the scheme;
 - Regional Assemblies;
 - Regional Development Agencies;
 - Transport operators (bus, rail, parking, UTC).
 - Local businesses;
 - Property owners;
 - Business groups (chambers of commerce, CBI, FTA, CPT);
 - Environmental groups;
 - Community groups; and
 - Cycling and walking groups (CTC, Pedestrian Association).
- **Statutory consultees:** Statutory consultees are organisations that the promoter must contact and involve in the scheme development process. The most important of these are Statutory Environmental Bodies (e.g. English Nature, English Heritage), emergency services and the utility companies (telephone, gas, electricity, cable TV, etc) likely to be effected by the proposals.
- **Consultants:** Employed to advise interested parties on particular aspects of the scheme, and to draw up detailed proposals. Most commonly these are in respect of civil engineering, travel demand forecasting, project finance, project management and economic and environmental impact appraisal.
- **General public:** This includes.
 - trip makers within the area of scheme influence;
 - communities directly affected by the scheme; and
 - the public at large within the local area (and nationally for more controversial projects).
- **Concessionaires:** Organisations taking overall responsibility for the project (or major elements of it) in return for agreed funding arrangements made with the scheme promoter.
- **Contractors:** Organisations contracted (directly by the scheme promoter or by the concessionaire) to implement the scheme. Examples include civil engineering, vehicle manufacturers, control system suppliers and environmental amelioration specialists.
- **Funding sources:** Funding sources are usually UK or national government, the European Union and commercial banks. The authority promoting the scheme and other stakeholders often also contribute to scheme funding.

5.3 Topics for Process Evaluation

An evaluation could cover any of the main activities involved in developing the scheme, from objective setting through design to implementation. It would be unusual though to include all of these for a single scheme.

5.3.1 *Development of scheme objectives*

Major transport schemes should be proposed and developed to help local authorities in meeting their defined objectives in the public interest.¹⁸ These objectives may be specifically about transport, but often cover areas such as environment, economic development and social inclusion.

In some cases it may be appropriate for a process evaluation to begin with consideration of the activity of developing these objectives.

A process evaluation of this stage would identify any problems arising from the specification of "solution-specific" objectives rather than "pure" objectives. A pure objective could be "improved access to facilities for those without cars". A solution-specific objective for tackling the same issue might be "investment in a segregated public transport network to help those without access to cars". The latter presupposes that the investment in a new public transport system is the best way to tackle access to facilities for the disadvantaged, and closes off potentially more cost effective approaches that could provide better services for a given expenditure. Inbuilt to solution-specific objectives is an assumption that a particular scheme type will be effective, and this may prejudice many downstream activities.

Even if objectives have been developed in advance of scheme identification, there is still a question as to how the particular scheme concept came about. Again, process evaluation might legitimately investigate this if there are concerns - to ask "was this the right scheme?"

5.3.2 *Activity from concept to provisional design*

This stage takes the project from a "line on a map" through to the stage where a preliminary appraisal could potentially be undertaken. It involves sub-activities such as:

- safeguarding of alignments; and
- entry into local plans (such as development plans or the LTP) and Regional Spatial Strategies.

5.3.3 *Detailed design*

The process of detailed design involves activities such as:

- defining precise alignments for new sections of highway or new off-road public transport schemes;
- design of key structures and specification of environmental amelioration measures;
- investigation of ground conditions to confirm engineering feasibility; and
- definition of vehicle technology and station locations for public transport schemes.

Major inputs from technical specialists are required for this activity. Provision for interaction between design teams and stakeholders is also required.

¹⁸ Unfortunately this is not always the case. Schemes in the past have been promoted because they are in some way 'appealing', and in a number of cases objectives have been written (or re-written) to provide support for the scheme. It should be an objective of process evaluation to identify such cases.

5.3.4 *Obtaining implementation powers*

A number of areas need to be addressed in obtaining authority to proceed with the scheme. The main areas are:

- local authority planning permission(s);
- local authority highway committee approval(s); and
- Transport and Works Act authorisation.

Obtaining authority by Act of Parliament however is no longer generally applicable to local authority schemes.

5.3.5 *Provisional costings*

Obtaining provisional scheme costings is a critical stage of a major scheme project. Avoidance of undue optimism is the key issues. Robust costing at this stage can prevent further expensive development work on schemes that are not viable.

Costings can usefully be considered under the headings of capital and operating, though there are numerous grey areas between these (such as the leasing of expensive light rail vehicles). Provisional allocation of costs to the various stakeholders is a desirable activity at this stage.

5.3.6 *Arrangements for a concession and/or capital procurement*

For some projects a decision is taken to transfer responsibility from the scheme promoter to an external concessionaire, and the process of transfer as the concession. Sometimes this approach is imposed on the local authority, rather than entered into from choice.

The process evaluation of concession arrangements and the normal alternative of capital procurement are discussed on sections 5.6.1 and 5.6.2.

5.3.7 *Scheme appraisal*

Scheme appraisal should be a continuous process with feedbacks to activities such as scheme design and funding applications, and should commence at the preliminary design stage. Appraisal becomes increasingly detailed as the project progresses. Appraisal headings are related to specific scheme objectives and government objectives as discussed in Chapter 4.

5.3.8 *Funding applications*

Scheme appraisal provides the starting point for applications for scheme funding. However, there is generally a need for iteration as the funding bodies will naturally raise issues, both of principle and detail, about aspects of the appraisal.

For a local authority scheme the main funding applications are generally to:

- the Department for Transport by the scheme promoter; and
- commercial banks by concessionaires.

5.3.9 *Stakeholder consultation*

There is generally a need for an ongoing process of consultation by the promoter with other primary stakeholders. The purpose of such consultation is to encourage active participation and a sense of ownership of the scheme.

Consultation with other interested parties can be more intermittent. Creation of a Wider Reference Group (WRG) with workshops held at key project stages has often proved effective.

5.3.10 Public consultation

The main purpose of public consultation is to seek the views of those who do not have a specific interest (positive or negative) in the project, but who might nevertheless be affected by it, or simply wish to express a view. A key requirement of such consultation is that a representative sample of views should be obtained. The process should not be dominated by unrepresentative minorities. Appropriate survey techniques for public consultation include direct interviewing and the use of focus groups.

5.3.11 Media handling

Throughout the project it is desirable to obtain positive reporting of the scheme from the media (press, television, radio). In particular, there is a need for careful handling of the release of information on the more controversial aspects of a scheme, that could result in adverse publicity.

5.3.12 Preliminary works

Preliminary works are often carried out in advance of the start of main works, sometimes before overall permission and funding arrangements have been confirmed. If mishandled such works can prejudice views about the scheme from stakeholders, the media and the public.

5.3.13 Main works

There are two key considerations for the main works of a project:

- programme management - the need to keep to timescales and costs, particularly in the light of unforeseen difficulties; and
- a need for monitoring of the concessionaire and/or contractors in terms of compliance with the agreed specification.

5.4 External Events

External events can affect the order and the effectiveness of the processes involved in implementing a major scheme. Sometimes they are to a degree predictable, and allowances could be made for them. Others occur without warning. Often external events can be traced to an action of one or more of the players identified in section 5.2.

Examples of external events likely to be significant for the implementation of a major scheme, and which may need to be noted in a process evaluation are:

- timing of local, regional and national elections;
- changes in leadership, and hence potentially of policy, of a governing political party;
- changes in Government policy, e.g. in relation to:
 - the appropriateness of the scheme, or the criteria for obtaining funds; or
 - overall availability of funding,
- Acts of God - disasters, abnormally bad weather; and
- Civil unrest - labour disputes, violent protestors, terrorism.

5.5 Procedure for a Full Process Evaluation

A full process evaluation would examine what was done, how efficiently this was done, and how the players and activities interacted, which may sometimes contribute to difficulties, or to conspicuous successes, in project implementation.

The methodology might be considered under eight sequential headings as follows. Other approaches could be equally effective, but would need to cover the same ground.

1. Preliminary discussions with primary players

This stage should include the scheme promoter, the concessionaire (if relevant) and the main funding bodies. If possible contact should be made with key personnel even if they have moved on to new posts or new employers. The interviews with the primary players should seek to:

- identify all activities undertaken and all players involved;
- obtain and catalogue copies of all key documents (reports, technical notes, meeting minutes, media articles etc), including outturn reports as well as reports from the appraisal stage;
- obtain views on the successes and problems associated with developing and implementing the scheme;
- if possible obtain cost estimates for each stage in the scheme development process (e.g. money expended on consultants, allocation of in-house resources).

2. Literature review

All relevant documentation should be examined in detail. A document register will need to be established. From each document a summary of key points should be prepared, with references to the main text.

3. Creation of process charts

Following discussions with key players and the literature review it will be possible to create two key process charts. These would be updated on a regular basis as further information about the scheme is obtained. These charts are:

- an interaction matrix, consisting of players and activities (as in Table 5.2); and
- a sequential or iterative (i.e. feedback) flow chart with dates.

Separate versions of the charts may be required if there are strongly differing views held amongst the key players about what really happened during scheme development and implementation.

The example of an interaction matrix in Table 5.2 shows an initial view of the strength of the interactions, such as might have been prepared (in an idealised way) by the evaluation manager at the start of the project. As the process evaluation proceeds the entries need to be backed by summaries of how, how often and ultimately how effectively the interactions took place. Some illustrative examples of these cell entries are as follows. These would become more detailed as the processes became better understood.

Table 5.1
Examples of Cell Entries in Interaction Matrix

| Cells | Illustrative cell entry |
|---------------------|---|
| 2a - 1 | <p>Property owners within the town centre were not consulted at the provisional design stage.</p> <p>Problems later arose in terms of opposition to attempts to obtain construction powers by those whose properties were affected.</p> <p>This opposition was ultimately cleared up, but caused delays to the overall process.</p> |
| 6 - 1, 2, 3, 4, 5,6 | <p>Concessionaires were not involved in the earlier phases of the scheme.</p> <p>Involvement at the funding application stage revealed major concerns about both the capital costs and revenue potential of the scheme.</p> |
| 2i-10 | <p>Community groups developed their own direct linkages to the media.</p> <p>Many adverse stories were run in the early days of the scheme development, leading to strong concerns from local politicians.</p> <p>This ultimately contributed to a delay in obtaining local approvals for the scheme.</p> |

The feed back flow chart would involve a number of dimensions, e.g. players, activities, events, and of course time. It would not generally be practical for such a chart to be presented in a single format or on a single piece of paper. It could however be prepared using project management software, with players being the "resources" and activities the "tasks", since such a chart has many characteristics in common with project planning charts (though it would seek only to show the final outturn version).

4. Consultation with other significant players

The consultation with key players and the literature reviews will have identified a number of other significant players who should be approached for interview. Such interviews should as a minimum involve:

- discussion of personal roles;
- check agreement or conflict with current versions of the process charts;
- obtaining any further relevant documentation (note the potential feedback to the literature review stage); and
- obtaining views on the successes and problems associated with developing and implementing the scheme.

5. First workshop of players

At this point in a full process evaluation it would be worthwhile considering a workshop of players. Such an event would be concerned with obtaining a common understanding of the facts and the timings associated with the process of development and implementation. It would also cover the area of successes and problems. The workshop could take the form of a presentation followed by a facilitated discussion (with the facilitator being external to the impact evaluation team, but nevertheless knowledgeable of the major scheme development process). Alternatively, focus group techniques could be employed.

6. Analysis

Available information from interviews, the literature search and the first workshop would be analysed. Final versions of the process charts would be created. Areas of success and significant difficulty would be subject to detailed scrutiny. Where possible this should result in the development of draft guidance to assist future scheme development and implementation projects. The key output from the analysis stage would be a note setting out preliminary conclusions and recommendations from the process evaluation.

7. Second workshop of players and stakeholders

A second workshop could now be considered to seek views on the preliminary conclusions and recommendations. These could usefully involve a wider range of participants than the first workshop, perhaps including all identifiable stakeholders. The workshop would begin with a brief summary of the scheme development and implementation, followed by a more detailed explanation of the problems and successes and the resulting recommendations. The workshop (or sub-groups) would then be asked to consider the material presented and give their views.

8. Reporting

The results of the second workshop would be considered and necessary changes to recommendations made. A draft report would then be prepared and circulated for comment to participants in the process. It would also be appropriate to supply the draft report to all players, even if they did not agree to participate in the consultation or workshop stages. Following receipt of comments, the report would then be finalised.

Table 5.2

| Matrix of Interactions Between Players and Activities in the Development and Implementation of a Major Scheme | | | | | | | | | | | | |
|--|--|--|---|---|--|---|---|--|--|---|--|---|
| | C o n c e p t t o P r o v i s i o n a l D e s i g n | D e t a i l e d D e s i g n | O b t a i n i n g I m p l e m e n t a t i o n P o w e r s | P r o v i s i o n a l C o s t i n g s | A r r a n g e m e n t s f o r t h e C o n c e s s i o n | S c h e m e A p p r a i s a l | F u n d i n g a p p l i c a t i o n s | S t a k e h o l d e r C o n s u l t a t i o n s | P u b l i c c o n s u l t a t i o n | M e d i a H a n d l i n g | P r e l i m i n a r y W o r k s | M a i n W o r k s |
| 1 Lead Scheme Promoter | XX X | XX X | XX X | XX X | XX X | XX X | XX X | XX X | XX X | XX X | XX X | XX X |
| 2 Other Stakeholders | | | | | | | | | | | | |
| 2a Other promoting authorities | | XX | X | X | X | X | XX | XX X | XX | X | XX | X |
| 2b Local politicians and MPs | X | XX | XX | | XX | | X | XX X | XX | XX | | |
| 2c Other Local LAs affected | | X | XX | | | | | XX X | X | | | |
| 2d Regional Assemblies | X | | XX | | | | XX X | XX X | | | | |

The Evaluation of Major Local Authority Transport Projects: A Guide for DfT

| | | | | | | | | | | | | |
|-------------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|----|---------|---------|
| 2e Regional Devt. Agencies | X | | | | | | XX X | XX X | | | | |
| 2f Transport Operators | | X | | | | X | | XX X | | X | | X |
| 2g Property Owners | X | XX X | XX X | | | | | XX X | XX | | | X |
| 2h Environmental groups | X | XX X | | | | XX | | XX X | | | | |
| 2i Community groups | XX | XX X | XX | | | | | XX X | XX | X | | |
| 2k Cycling and walking groups | X | XX X | | | | X | | XX X | | X | | X |
| 3 Consultants | | | | | | | | | | | | |
| 3a Technical | XX X | XX X | XX | XX X | X | XX X | XX X | XX | XX | X | X | X |
| 3b Financial legal | X | X | XX X | | XX X | | XX X | | | XX | | |
| 4 Statutory Consultees | X | XX X | X | | | | | XX X | | | X | X |
| 4a Statutory undertakers | X | XX X | XX | XX X | X | | | XX X | | | | |
| 4b Others | X | XX X | XX | | | | | XX X | | | | |
| 5 General Public | | | | | | | | | | | | |
| 5a Trip makers | | | | | | | | XX X | XX X | | XX | XX |
| 5b Affected communities | XX X | XX X | XX X | | | | | XX X | XX X | | XX | XX |
| 5c Public at large | XX | | XX | | XX | | | XX X | XX X | | XX | XX |
| 6 Concessionaires | | | | | | | XX | | | | XX X | XX X |
| 7 Contractors | | | | | | | | | | | XX X | XX X |
| 8 Funding Sources | | | | XX X | XX X | XX X | XX X | | | | | |
| 8a Public Sources (incl DfT) | | | | XX | XX X | XX X | XX X | | | | | |
| 8b Commercial Sources | | | | | XX X | XX X | XX X | | | | | |

Key: XXX strong interaction expected, X weak interaction expected

5.6 Process Evaluation of Specific Activities: Questions to Ask

This section considers some specific applications of process evaluation. It illustrates the kind of process issues that may arise in the course of a project, and the types of questions that could sensibly be asked and avenues pursued in an evaluation. Applications considered are:

- scheme costing and capital procurement;
- concession arrangement;
- environmental issues; and
- the implementation process.

5.6.1 *Process evaluation of scheme costing and capital procurement*

Scheme costing is an area of significant project risk. Cost estimates evolve through the various stages of a project (e.g. as set out in Table 5.2) including:

- scheme concept;
- provisional design;
- detailed design;
- scheme appraisal; and
- funding applications.

At each stage the costings become progressively more detailed. It is often noted that estimates tend to increase as more becomes known about the scheme. However, a specific issue that has occurred in a number of projects is that estimated costs have increased substantially in the very late stages. In a number of cases schemes have been developed to a high degree of detail, expending very significant appraisal resources, before it has been discovered that capital costs are so high that the project is unviable. If the high costs had been known at an early stage, the scheme could have been greatly revised or abandoned.

Therefore, it seems quite likely that a specific requirement of many process evaluations will be to investigate the methods used to obtain costings. This section looks at the issues in some detail, in the context of a conventional public sector project with capital works ultimately to be procured via a process of competitive tender held with contractors working to the scheme promoter. Issues associated with the presence of a concessionaire within the procurement process are discussed in the next section.

An approach that might be taken to investigating the process of costing a major scheme could involve asking the following types of question:

- Were outturn costs from comparable exercises used at the scheme concept or provisional design stages?
- Similarly, was use made of published unit cost outturn data (e.g. unit costs per track kilometre for light rail schemes)?
- Was an explicit allowance made for optimism bias in the early stages of the project?
- Was the technical specification for the scheme above that which was strictly required for the role to be played (and if so what gave rise to this)? Was there a reluctance to decrease the specification in the face of rising cost estimates?

- Were all parties affected by the scheme involved in the consultation process at an early enough stage such that their requirements were reflected in early cost estimates?
- To what extent did consultants involved in the costing process have a potential interest in maintaining the progression of the scheme (e.g. simply to please their client or to ensure further downstream fees)? Was there any evidence of pressure placed on consultants to cost on a very tight basis in order that the scheme might not be halted?
- What was the relative scale of effort put into the various components of scheme costing, and did this reflect the scale of the components and known risk factors (e.g. was too much emphasis put on physical works and not sufficient upon land acquisition costs and environmental mitigation costs)?
- When works were put out to tender, what were the reasons given by contractors for rejecting the estimates made by the promoter's consultants? Was such a question asked of contractors at the time? Was their sufficient time for iteration between consultants and contractors at the tendering stage to obtain a consensus? Was such contact even permitted?
- Were costs controlled at the preferred bidder stage of procurement, or were increases requested and agreed to? If costs rose at this stage, what were the reasons given (e.g. a factor legitimately assumed by the contractor to be fixed, which subsequently turned out not to be so).

5.6.2 Process evaluation of concession arrangements

Concessions are relatively new feature of major schemes, and so it is quite likely that future process evaluations will be asked to look at their formulation and effectiveness in some detail. In particular, it has been suggested that the balance of risk within concessions has been affecting the willingness of private sector companies to compete for a concession, and their bid prices.

Concessions can take many forms and involve complex contractual conditions. The degree to which responsibility and project risk is transferred to the concessionaire is the critical component of the concession. A simple concession would involve responsibility for operating a new public transport service for a fixed period, at a fixed cost, with all revenue returned to the public authority. A more comprehensive concession would involve an external organisation taking over the detailed design, build and financing of the project, and its operation for a fixed term. The form of the concession, in particular the apportionment of project risk, is thought by many to have a significant impact upon project costs.

Further important issues relating to concessions are:

- the selection process for the concessionaire;
- provisions for resolving subsequent disputes and associated contractual changes; and
- provision for amendments relating to expansion of the scheme (e.g. second and subsequent LRT routes in the long term development of a full network).

This section looks first at a stylised example concession¹⁹, and then considers how the processes related to it could be evaluated. The scheme objective that is of particular relevance to the process evaluation of concessions is that of achieving overall value for money. However, a poorly performing concession could impact upon many aspects of scheme outturn and impacts, and hence affect many of the scheme objectives.

A concession for a new public transport service on a dedicated route may be set up sequentially along the following lines.

¹⁹ This example covers concession issues only to the stage of appointment; it does not extend to relationships during operation.

- The scheme promoter carries out an appraisal and sets out key parameters such as estimated capital and operating costs, and estimated revenues, for a core scheme.
- Potential concessionaires are asked to pre-qualify for the concession process, by demonstrating their technical capability and their potential financial backing - concessionaires generally consist of a consortium of organisations, in particular engineering contractors (civil, mechanical) and financial organisations;
- The scheme promoter prepares a prospectus for the scheme concession based on the preliminary appraisals, in this example:
 - concessionaires are expected to carry the risks associated with capital costs, operating cost and revenues, on the basis of a fixed contribution to capital costs made by the promoting authority;
 - the bidders are invited to use their expertise to further develop the proposal in a cost effective way - i.e. the bids eventually received are not strictly for the same project specification.
- Bidders are asked to outline their scheme design proposals and submit their requirements for capital cost subsidy.
 - bidders will have needed to scrutinise cost and revenue breakdowns provided by the scheme promoter;
 - discussions will need to be held between bidders and commercial banks - these would fund the bids in return for interest payments, but will have concerns about the financial viability of the concessionaire generally, and the proposed project in particular.
- The scheme promoter and the major stakeholders scrutinise the bids from concessionaires and draw up a short list, typically of two bidders.
- The bid prices would be considered closely against the potentially available public sector sources of funding
- Detailed discussions/negotiations would be undertaken with the short listed bidders (and potentially their backers) leading to the selection of a preferred bidder.
- Further detailed negotiations with the preferred bidder are then undertaken, leading to final agreement on the concession.

Example questions relevant to a process evaluation include:

- Was the preliminary appraisal (step 1 above) unduly optimistic or unduly pessimistic? Did it serve to encourage or discourage continuing participation by external firms? Did a sufficient number of firms show an interest?
- Was the degree of risk bearing a major factor in potential concessionaires deciding whether or not to proceed with their bid (step 4)? Were reasons for proceeding or not proceeding explored at the time by the scheme promoter?
- Did this approach to scheme refinement result in widely differing approaches being taken by bidders for the concession (steps 4 to 8)? Did this complicate or slow down the appraisal of bids by the promoter and stakeholder?
- Was there a marked disagreement between the promoter's estimates of costs and revenues and those of the potential concessionaires (step 7)? Were the latter's cost estimates consistently higher? Were they consistent in scale with each other, or did they differ widely?
- Was there any indication of a general unwillingness on the part of banks to accept the concession arrangements? Was the allocation of risk a major issue? Was any unwillingness to proceed caused by external factors such as higher returns from projects elsewhere?

- Were there enough acceptable initial bidders to make the shortlisting process worthwhile (step 6)? If only two consortia were shortlisted, were both considered to be potentially acceptable, or was one effectively a makeweight?
- Were bid prices comparable in scale with the level of public sector funding being discussed with DfT, EU and local stakeholders? What was the scale of any discrepancy? How early in the appraisal/concession process had public sector funding requirements been indicated, and was this too early for them to be robust?
- Did the shortlisted concessionaires make substantial positive or negative changes to the attractiveness of their bids during negotiations (step 8)? If so why and in what area (e.g. capital costs, anticipated revenues etc). What were the reasons given for any change of views?
- Did the selected preferred bidder make significant changes after selection? Did any unforeseen issues arise at this late stage in project development (step 9)?

5.6.3 Process evaluation of the handling of environmental issues

It is now a requirement for major local authority transport schemes that a Strategic Environmental Assessment (SEA) is undertaken as part of the appraisal process. The primary purpose of an SEA is to ensure that environmental considerations are at the heart of project thinking. In the past it has sometimes been the case that, whilst environmental impact is appraised once the broad concept of the scheme has been defined, environmental considerations and opportunities do not play a proactive part in the scheme development process. The handling of environmental considerations within scheme development may therefore be a topic for investigation via process evaluation.

Investigating this issue could involve asking the following types of question:

- Were there any specific environmental objectives defined for the scheme?
- Were environmental groups encouraged to participate in the scheme design process? Often representatives of these groups are volunteers - were they ever provided with specialist technical support paid for by the promoter?
- Was input from the Statutory Environmental Bodies sought at the scheme design stage? Were these bodies willing/able to engage in a detailed way?
- Was there an implicit (or even explicit) valuation of environmental impacts relative to other issues at the scheme concept and preliminary design stages? Is there any evidence that alternatives with more positive environmental performance were not therefore considered?
- How explicit was any trade off between environmental objectives and other objectives at the scheme appraisal stage? Who was making this trade-off and was any reasoning set down? Was there comprehensive quantification of environmental impacts? Was any monetisation of environmental impacts employed?
- During the consultation/participation stages, were members of the public or voluntary bodies with environmental concerns assisted with putting their case? Alternatively, were they in effect overwhelmed by arguments and data put forward by well funded lobby groups such as those with an economic development interest?

5.6.4 Process evaluation of the implementation process

Even in circumstances where few issues arose up to the point of final scheme approvals, deficiencies in the earlier project stages may have become apparent during implementation.

The assumption in this section is that a standard public sector procurement procedure will have been employed, rather than use of concession/concessionaire arrangements. However, many of the issues raised here are relevant to both types of procurement.

Process evaluation of the implementation process could involve asking the following types of question of the management and monitoring:

- Was there an agreed set of (regular) milestones in the contract, against which to judge contractor performance?
- Did any serious issues about interpretation of the meaning of the implementation contracts arise? Were the contracts adequate to protect the interests of promoter, stakeholders and contractors. Were there gaps that allowed the contractor to skim on the work (from the perspective of the promoter) or to legitimately claim that a specific item was not an agreed deliverable?
- What monitoring arrangements were put in place by the promoter? Was a single individual nominated to manage the implementation monitoring process? What scale of resources were made available?
- Was there an ongoing process of public and stakeholder consultation/participation to deal with implementation issues? Was this formalised (e.g. regular meetings and reports) or informal, taking place only when problems arose?
- What provisions were there for contract variations in respect of unforeseen difficulties? What was the allocation of risk between promoter and contractors (e.g. in the event of unexpectedly poor ground conditions)?
- What compromises were made to the specification to hold down cost escalations where significant problems arose? How were decisions about reduced specifications arrived at (e.g. were the wider stakeholders consulted)?

5.6.5 Media Handling

Ensuring a positive relationship with the relevant media organisations can be important both in terms of scheme development and scheme implementation. In respect of a local authority major scheme the relevant media are usually the local press, radio and television. For novel or controversial schemes the national media may take an interest.

An unsympathetic (or even hostile) media can cause very significant problems. The impact on public and political perceptions resulting from poor relationships with the media can seriously delay the scheme. For schemes where problems with media relationships have arisen, or where there is considered to have been a notable success, it may be appropriate to make this a specific issue for process evaluation.

Investigation of the media handling aspects of the development of a major scheme proposal could involve asking the following types of question:

- Was the controversial nature of the scheme recognised by promoter and stakeholders at the project outset?
- Was dealing with the media recognised as a specific project task? Alternatively, was it left to ad hoc arrangements or use of standard procedures of the promoting authority and any of the other authorities involved?
- Was there an agreement between the promoting authorities to coordinate their media handling - e.g. by referring all enquiries to a designated authority/person?
- Was a specific media handling plan prepared? Was this positive or reactive in nature (i.e. did it seek to actively involve the media to gain positive support for the scheme, or simply make provision to respond to inaccurately reported aspects of the scheme proposals)?
- What was the frequency of contact with the media? Were regular briefing sessions employed in order that editors had the promoter viewpoint in advance of issues being raised by opponents of the scheme?

6. Presentation and Use of Evaluation Results

- *Evaluations should be designed to be useful*
- *Presentation and dissemination of evaluation is no less important than technical quality*
- *Presentation and dissemination needs to depend strongly on the nature and purpose of the evaluation*
- *Publication offers both benefits and obstacles, which need to be thoughtfully managed*
- *There are established Do's and Don'ts for evaluation reports*

The EC Guide to programme evaluation (see Bibliography) notes in its opening paragraph on "Reporting and disseminating evaluations", that "evaluations differ from ordinary research studies in that they are designed to be operationally **useful**." In contrast it is sometimes commented of transport evaluations in the UK that, notwithstanding high technical quality, there is little evidence of their subsequent use.²⁰

The EC also comment that the sponsors of the evaluation need to think about strategies for communicating the results of the evaluation at the same time as they are planning the evaluation itself. To this should be added the need also to think through, while planning the project, the purpose of the evaluation, and the audience or audiences (i.e. prospective *users*) to whom it will be addressed.

6.1 The Importance of Presentation and Dissemination

Historically there has been a tendency in some transport evaluation reports to focus on technical content and quality, with less emphasis on the precise purpose of the work and on presentation to achieve that purpose. It is a crucial role for the sponsors of evaluations to design and follow up reporting styles and procedures that are tailored to the evaluation's specific purpose or purposes and to its specific audiences.

There is then a further role, for the evaluation sponsor and often for other bodies, in ensuring that the work is subsequently well used.

The EC Guide on programme evaluation suggests, as a useful checklist that applies equally to project evaluation, that an evaluation report must be presented so that a potential reader can understand:

- exactly what was evaluated;
- how the evaluation was designed and conducted;
- what evidence was found;
- what conclusions were drawn; and
- what recommendations, if any, were made.

Achieving this can be a challenge. It may call for a variety of writing styles for different parts of an evaluation report and to meet the needs of different kinds of potential user.

Some key pointers of style and substance to a useful evaluation report include:

²⁰ Sometimes because high quality technical work has been done within an impact evaluation design that is not geared to providing useful conclusions about the scheme.

- It must "tell a story", especially in its Executive Summary, which will be all that most recipients will read.
- It must make very clear the nature and the basis of the counterfactual or counterfactuals with which actual outturns or outcomes are being compared.
- It must be very clear in its analysis of causality, for example impact evaluations need to explain clearly how they have handled issues such as deadweight, displacement and substitution.

The subsequent use of evaluation data cannot be taken for granted. Procedures are needed to ensure that the information provided by evaluations reaches those to whom it may be of value and is where appropriate acted upon. For evaluations designed either for accountability or explicitly to provide information for the promoting authority, this responsibility lies with the authority in question and should be seen as a component of the planning of the evaluation.

6.2 Use of Evaluation for Accountability

Evaluation may be designed to demonstrate to, say, taxpayers, central government and the promoting authority's senior officials and members how well a scheme has delivered its expectations and the main reasons for significant deviations.

Few people reading such an evaluation will wish to examine technical detail. What is needed for accountability is reporting which "tells a story" of where the project in important ways fell short of or exceeded expectations, and broadly why, with detail provided only (perhaps in annexes) to reassure any sceptical reader that the story is based on good analysis.

Sometimes there may be pressure for an evaluation of this kind to serve political interests, to reflect well on those involved in promoting or implementing the project, either by spinning a good story or suppressing information about disappointing outcomes. If there is truly a good story to tell there can be no objection to a public or private sector organisation telling it to its advantage. But there is no value in evaluation that is not objective, but biased to reflect the interests of one or another party.

At the same time it is not helpful for an evaluation to ascribe blame. If a project has fallen materially short of expectations it is important for this to be made clear, with an indication of what went wrong in terms of, for example, flawed forecasting, unforeseeable external events, or weaknesses in design. But if there is any question of institutional or individual blame this is not an issue for evaluation, but for other mechanisms where this is necessary. An evaluation report that in effect assigned blame would be unhelpful, both in the reactions that it would provoke and in the damage that it would do to the prospects for objective evaluation in the future.

6.3 Use of Evaluation to Provide Information for Future Use

Evaluations can provide information for future use in modelling, in policy or engineering innovation, and/or progress in capital procurement or other aspects of management.

Some information of this kind may be of more value to central government, or to local authorities collectively, than to the promoting authority. This makes it all the more important for evaluation objectives, evaluation funding, and methods of subsequent dissemination, to be clearly established early in planning of the scheme.

The scope for further developing systematic use of transport project evaluation and the data it provides, to help improve the understanding of appraisal generally, and of modelling and forecasting in particular, is an issue to be explored over time by interested parties.

In principle, scope might be expected for a pool of information, available to all local authorities, on the lessons that appear to follow from comparisons of outturns with model based forecasts and analyses of possible explanations for the differences. The same may apply to policy and engineering innovation.

Capital procurement, or concession negotiation, may be areas in which interest in information for future use is more concentrated in the Department for Transport. The basic evaluation required for accountability purposes may incorporate enough data on capital procurement to build up a database to indicate how achievement is changing over time, and perhaps how it varies in systematic ways across different types of asset. These are further areas to be explored.

6.4 Publication of Evaluation Studies

Knowledge that an evaluation study is to be published may increase political constraints. It therefore needs to be clear from an early stage what work the authority will publish. Authorities may also sometimes wish to consider what may subsequently be brought into the public domain under the Freedom of Information Act, 2000.

Normally evaluation work that is contracted out will be published. However contracting out impact evaluation may help to separate published factual analysis from potentially more sensitive, unpublished interpretation for officials and members. Internal interpretations of the implications of commissioned impact evaluation studies need to be considered on their merits. Gateway Reviews, for example, are confidential and not publicly available.

Process evaluation may often be internal work (albeit carried out by officials who were not themselves direct participants in the processes being evaluated), and again often confidential for the same reasons as Gateway Reviews.

For case specific guidance on the potential for information being subsequently released under the Freedom of Information Act authorities should refer to their own experts. However good guidance in layman's terms on the application of the Act is provided by the Information Commissioner's Office at <http://www.ico.gov.uk/eventual.aspx?id=9183> and Department of Constitutional Affairs guidance is at <http://www.dca.gov.uk/foi/guidance/index.htm>. The Act itself is at <http://www.opsi.gov.uk/ACTS/acts2000/20000036.htm>.

6.5 Do's and Don'ts for Evaluation Reporting and Dissemination

There may be little if anything to be gained from standardisation by a local authority, still less central government, of features such as the format of published evaluation reports, beyond basics such as the requirement for an executive summary. There is however scope for setting certain requirements of evaluation reports for accountability in ways that feed back to help improve the planning and subsequent conduct of evaluations.

This might include for example requirements for completeness (e.g. coverage of capital works) unless clear reasons are provided for exclusions, and a similar requirement for the presentation of analytically (i.e. model) based counterfactuals, or a good explanation of why this is not done.²¹

It may also include standard, minimum lists of headings for particular types of evaluation, not least to facilitate subsequent comparisons between schemes and/or over time.

Such standard requirements, and standard forms of reporting, are clearly necessary for data on issues such as capital procurement if these are to be centrally collected and analysed, to give an overview of cause and effect and time trends across all major projects.

The EU Guide on programme evaluation²² provides useful guidance on reporting and dissemination evaluations, covering the maximisation of the use of evaluations and the presentation of an evaluation report. These principles apply equally to project evaluations and are reproduced below.

²¹ The NAO Report of 2004 on light rail schemes commented on the incompleteness of the evaluations, which was in part because of the absence of serious modelling to understand the counterfactuals. (*Improving Public Transport in England through Light Rail*, Report by the Comptroller and Auditor General, HC 518 Session 2003-2004: 23 April 2004 http://www.nao.org.uk/publications/nao_reports/03-04/0304518.pdf)

To maximise the use of evaluations:

- try to target the message to the particular information needs of a given audience;
- ensure that reports are timely;
- where possible, involve stakeholders in the choice of evaluation design.

On the presentation of the evaluation report, in terms of structure and clarity, and on the dissemination of evaluations, observe the following Do's and Don'ts.

Table 6.1
Presentation of the Evaluation Report

| The structure of an evaluation report | |
|---|--|
| DO | DON'T |
| <ul style="list-style-type: none"> ■ Ensure that the structure of the report meets the needs of the sponsors and the principal stakeholders ■ Ensure that the report includes an executive summary. It should also be possible to circulate this as a separate document ■ Ensure that the report includes a copy of the terms of reference | <ul style="list-style-type: none"> ■ Do not move between unrelated issues ■ Do not include information that is unimportant for the overall message (even if the information is interesting) ■ Do not include too many tables and figures in the main report. Detail is best kept in an appendix |
| The clarity of the evaluation report | |
| <p>Ensure that a potential reader can understand:</p> <ul style="list-style-type: none"> ■ the purpose of the evaluation ■ exactly what was evaluated ■ how the evaluation was designed and conducted ■ what evidence was found <p>And by "telling a story" make it clear to the reader:</p> <ul style="list-style-type: none"> ■ what conclusions were drawn ■ what recommendations, if any, were made | <p>Try to avoid the following problems which can detract from the clarity of a report:</p> <ul style="list-style-type: none"> ■ executive summaries which are hastily written ■ describing the programme in insufficient detail ■ failing to describe the methods used for data collection and analysis ■ failing to justify the choice of methods or to indicate the strengths and weakness of the chosen design ■ using information without giving the source ■ arriving at findings which are not based firmly on evidence ■ reaching conclusions which are not systematically supported by findings making recommendations which are not adequately |

²² European Commission (1997) *Evaluating EU Expenditure Programmes: A Guide – ex post and intermediate evaluation*. The Commission's current guide on evaluation. http://europa.eu.int/comm/budget/evaluation/guide/guide00_en.htm

| | |
|--|---|
| | derived from conclusions |
| The dissemination of evaluations | |
| <ul style="list-style-type: none"> ■ Communicate evaluation findings in ways which are appropriate to the information needs of the different stakeholders ■ Aside from circulating the full report, use the executive summary or other means - e.g. audiovisual presentations ■ Tackle potential conflicts of interest between stakeholders through an inclusive management structure ■ Ensure that findings, conclusions and recommendations are clearly separated ■ Ensure that, where necessary, programme managers can formulate their own observations on reports prepared by external experts | <ul style="list-style-type: none"> ■ Don't allow evaluation to become entangled in negotiation |

7. Glossary

This Glossary defines terms as they are used in this Guide. The definitions are conventional in the context of transport evaluation, but some of these terms may be used in different senses in other applications.

Appraisal The process of defining objectives, examining options and weighing up the costs benefits, risks and uncertainties of those options before a decision is made. (cf Evaluation)

Audit Sometimes a control function, concerned mainly with verifying legality and regularity, as with financial audit. However value-for-money audit, or performance audit, is concerned with questions of efficiency and good management of programmes or projects and has much in common with evaluation. Evaluation typically has a wider perspective as it is carried out on behalf of the policy, programme or project sponsor.

Causal chain analysis A set of techniques for tracing cause-effect pathways through the immediate or direct causes of an impact or problem back to its root causes.

Confidence interval A range, estimated from a set of sample data, within which the actual value of a variable is likely to fall, with some given probability.

Correlation coefficient The correlation between two variables as estimated by a regression analysis.

Covariance A statistical measure of how much two variables vary together.

Counterfactual An estimate of what would have happened if the project (programme or policy) being evaluated had not been undertaken, or had been undertaken in some specified different way.

Cross-sectional data A set of data relating to the same point in time, but for a variety of different sources, such as geographical areas, income bands, or projects. (cf Longitudinal data)

Deadweight The extent to which public expenditures to promote a set of desired outcomes are in practice ineffective because the outcomes would have occurred without the expenditure - for example a better interchange may appear to increase bus usage, but most or all of this increase may have happened anyway because of increasing congestion and parking restrictions.

Delphi survey A technique using an iterative, questionnaire approach to establish a consensus opinion from "experts", when the decisive factors are subjective, and not knowledge-based. It is now generally conducted by email, by expert facilitators.

Displacement The degree to which benefits in one area are offset by disbenefits elsewhere - for example a new road may reduce traffic in some populated areas of a town, but displace it to others.

Effectiveness The extent to which a project, programme, or policy achieves its outcome objectives. (cf Efficiency)

Efficiency The ratio of inputs to outputs. (cf Effectiveness)

Evaluation Retrospective analysis of a project, programme, or policy to assess how successful or otherwise it has been, and/or what lessons can be learnt for the future. (cf Appraisal)

Formative evaluation An evaluation concerned with examining ways of improving and enhancing the implementation and management of a programme or project, generally for the benefit of those managing the programme or project. (cf Summative evaluation)

Hypothesis testing Determination of how likely it is that the difference between two samples indicates that they are drawn from different populations.

Impact evaluation The evaluation of, usually, the effectiveness of economic, social and environmental impacts of a programme or project. An impact evaluation may or may not also consider value for the money spent on the programme or project.

Implementation Used in the context of transport schemes to describe either the time at which the scheme, or a particular stage, becomes operational, or all the processes from contract award, or start of civil works, to scheme opening.

Level of significance The threshold used to decide if an observed difference between two samples was unlikely to have been observed by chance, usually expressed as a probability.

Longitudinal data A set of data collected over a significant period of time - sometimes called time series data. (cf Cross sectional data)

Mean (or average) The sum of a set of values divided by the number of values

Median The value at the middle of the distribution (where equal numbers of the other values are smaller and larger).

Mode The most frequent value of a distribution.

Monitoring The continuous process of examining the delivery of outputs, usually with the intention of immediately correcting any deviation from operational objectives. Monitoring often generates data which can be used in evaluations.

Normal distribution A very widely assumed, bell shaped type of probability distribution, defined by a combination of the mean and the standard deviation.

Opportunity cost The value of the most valuable of alternative uses.

Outcome Eventual benefits to society, such as less time wasted and environmental damage caused by congestion. (cf Output)

Output Outputs are tangible effects that are produced directly as a result of scheme, that can be clearly stated or measured and which relate in some way to the desired outcomes. In transport outputs typically include travel demand and socio-economic effects in the short, medium and long term, such as changes in flows, speeds and/or composition of traffic, or noxious emissions in a particular location. (cf Outcome)

Policy A set of activities that may differ in type and have different direct beneficiaries, but are directed towards common general objectives. Policies are not defined in terms of time schedule or budget. (cf Programme)

Primary data This is data taken directly from original sources or collected at first hand.

Process evaluation An evaluation of the planning and management of a project as a whole, or of some specific components of it, such as capital procurement or concession negotiation and management.

Programme A set of activities directed towards the achievement of specific objectives. Programmes have a definite time schedule and budget, but may encompass several different projects. (cf Policy)

Project A single, non-divisible activity directed towards operational objectives, with a fixed time schedule and a dedicated budget.

Range The difference between the largest and smallest of a sample of values.

Regression A statistical technique used to explain, in statistical terms, the behaviour of one variable (the dependent variable) using the predictive power of another variable (the independent variable), assuming both variables have normal distribution. **Multiple regression analysis** is applied where there are two or more independent variables.

Revealed preference The inference of willingness-to-pay for something which is non-marketed by examining consumer behaviour in a similar or related market. (cf Stated preference)

Scope The scope of an evaluation, as defined in its specification, is the impacts or processes that are to be evaluated. The scope will include aspects of methodology, such as requirements for surveys, or models, if these are to be defined by the sponsor rather than proposed by the prospective evaluator.

Secondary data This is data that, when accessed, have already undergone extensive manipulation and interpretation.

Sponsor The body or bodies responsible for the scheme being evaluated - generally the local authority, with some sharing of the sponsorship with DfT if the Department is providing project specific funding.

Stakeholder The individuals and organisations who are directly and indirectly affected by the implementation and outputs of a project, and who are likely to have an interest in its evaluation, typically including managers, policymakers, the target population and relevant lobby groups.

Standard deviation The square root of the variance.

Stated preference Willingness-to-pay for something that is non-marketed, as derived from people's responses to questions about preferences for various combinations of situations and/ or controlled discussion groups. (cf Revealed preference)

Substitution The situation in which (generally good) impacts are realised at the expense of others - e.g. a firm substitutes one activity for a similar activity (such as recruiting different, but no less socially excluded job applicants in response to a subsidised travel to work scheme).

Summative evaluation Summative evaluation examines the effectiveness, and possibly value for money of a programme or project, after implementation, and generally for the benefit of external actors not responsible for the programme or project management.

t distribution A type of probability distribution associated with the normal distribution, but defined by a combination of the mean, variance and sample size. It becomes the same as the normal distribution if the population variance (as opposed to merely the sample variance) is known.

Variance The average of the squares of differences from the mean of each value of a distribution.

8. Bibliography

The publications listed below are public sector guides. Some, such as the Cabinet Office Magenta Book, provide more detailed guidance on some technical aspects of evaluation. Some, such as the Treasury Green Book, are definitive guides, but focusing as much, or more, on appraisal. Others, such as the EU guides are of more general interest.

Cabinet Office (2003) *The Magenta Book: Guidance Notes for Policy Evaluation and Analysis*. Methodological guidance for those who use and commission policy evaluation, as specialists or generalists. http://www.policyhub.gov.uk/magenta_book/index.asp

Department of Environment Transport and the Regions (2000) *Multi-Criteria Analysis: A Manual*. Central government guide on multi-criteria analysis. http://www.odpm.gov.uk/pub/252/MulticriteriaanalysismanualPDF1380Kb_id1142252.pdf

Department for Transport (2004) *Guidelines for Evaluating Road Safety Education Interventions*. A well written guide on programme evaluation, addressed to road safety officers and other practitioners in road safety education. http://www.dft.gov.uk/stellent/groups/dft_rdsafety/documents/page/dft_rdsafety_033726.pdf

Department for Transport (2006) *DfT Transport Analysis Guidance (WebTAG)*. Guidance on the conduct of transport studies, especially appraisal. <http://www.webtag.org.uk/>

Department for Work and Pensions (2001) *Research Methods For Policy Evaluation*. Provides guidance on how to design both process and impact policy evaluations. <http://www.dwp.gov.uk/asd/asd5/WP2.pdf>

European Commission (1997) *Evaluating EU Expenditure Programmes: A Guide - ex post and intermediate evaluation*. The Commission's current guide on evaluation. Specifically addressed to programme evaluation and to the needs of the European Commission, but an exceptionally well constructed guide, covering many issues which apply to all types of evaluation. http://europa.eu.int/comm/budget/evaluation/guide/guide00_en.htm

European Commission (1999) *MEANS Collection: Evaluating Socio-Economic Programmes (6 volume set)*. A detailed overview of approaches to evaluating elements of socio-economic programmes funded by EC Structural Funds. Summary only at http://europa.eu.int/comm/regional_policy/sources/docgener/evaluation/means_en.htm

HM Treasury (2003) *The Green Book: Appraisal and Evaluation on Central Government Treasury Guidance*. UK central government's most authoritative source of guidance, with which departmental guidance such as that of DfT is required to be consistent, on policy, programme and project appraisal and evaluation. http://www.hm-treasury.gov.uk/media/785/27/Green_Book_03.pdf and Annexes at http://www.hm-treasury.gov.uk/media/54C/E8/Green_Book2_03.pdf; with related files at http://www.hm-treasury.gov.uk/economic_data_and_tools/greenbook/data_greenbook_index.cfm

Office of the Deputy Prime Minister (2004) *Assessing the Impacts of Spatial Interventions: Regeneration, Renewal and Regional Development - "The 3Rs Guidance"*. Supplements the Treasury Green Book in the area of spatially focused policies, programmes and projects. http://www.odpm.gov.uk/stellent/groups/odpm_researchandstats/documents/page/odpm_research_029332-01.hesp

Scottish Executive (2003) *Scottish Transport Appraisal Guidance (STAG) - version 1.0*. A well written guidance document for contractors and Local Authorities appraising transport projects in Scotland, including a chapter on monitoring and evaluation. <http://www.scot-tag.org.uk/stag/index.html>

OXERA *How Should the Ex Post Evaluation of Trunk Road Schemes be Enhanced?* Report prepared for Department for Transport, June 2005. A good critical assessment of the practice and use of trunk road scheme evaluations, with a focus on post opening impacts rather than capital procurement. Includes discussion of the cost of data collection techniques and a discussion of process evaluation.
http://www.dft.gov.uk/stellent/groups/dft_control/documents/contentservertemplate/dft_index.hcst?n=14180&l=3

Appendix A. Transport Scheme Objectives

The appraisal conventions for major transport schemes in the UK are quite prescriptive about objectives. The Government's five high level objectives for transport are (from WebTAG Unit 2.2, *Objectives and Problems*):

- to protect the built and natural environment;
- to improve safety;
- to support sustainable economic activity and get good value for money;
- to improve access to facilities for those without a car and to reduce severance; and
- to ensure that all decisions are taken in the context of the Government's integrated transport policy.

These objectives form the basis for scheme appraisal, and, at the appraisal stage, the extent to which they should be achieved are set out in an Appraisal Summary Table (AST), the preparation of which is a requirement for all major schemes. The AST addresses each of the Government objectives, as illustrated in Table A.1.²³ The AST is backed up by a number of more detailed worksheets, most notably:

- the Transport Economic Efficiency (TEE) and Public Accounts tables²⁴; and
- environmental impact worksheets.

Thus quantitative and qualitative entries within the final version of the scheme AST, which is the basis on which funding by Government was approved, can reasonably be taken as a form of scheme objective. Objectives would be "achieved" if outturns were broadly as predicted. They would be bettered if, for example, environmental impacts of a new road on land drainage were less adverse than expected. They would be missed if, for example the patronage of a bus scheme was much less than expected, and hence impacts on accessibility and road traffic congestion were below forecasts.

In addition to the five Government objectives listed above there are also other, overlapping sets of objectives:

- shared priorities (between Government and the Local Authority Associations);
- objectives for the relevant local transport plan;
- objectives specific to the scheme.

The Government has agreed the following four *shared priorities* with the Local Government Association (as set out in the *Full Guidance on Local Transport Plans, Second Edition, December*

²³ This particular illustration is based on the AST for a Local Transport Plan, rather than for an individual scheme as would normally be relevant for an evaluation study. However it illustrates the kinds of issues which may arise across a very wide range of headings.

²⁴ The Transport Economic Efficiency (TEE) table presents the time and money impacts on travellers (business, consumer and goods) and the monetary impacts on private sector transport providers (e.g. public transport and car park operators). The table includes a breakdown of traveller impacts by travel time, vehicle operating costs and user charges (fares, parking, tolls). The Public Accounts table records the financial impacts on local and central government. Together the TEE and Public Accounts data permit estimation of the Net Present Value and the Benefit/Cost ratio.

2004). These indicate which of the Government's objectives are seen to be the most important by both Central and Local Government:

- tackling congestion;
- delivering accessibility;
- safer roads; and
- better air quality.

The guidance on *Local Transport Plans* also encourages the definition of specific local objectives. An example set is shown in Box A.1. These mirror the Government objectives.

Scheme specific objectives set at the time of the appraisal can also broadly mirror the Government objectives. However, they more commonly have a localised flavour. Most often local objectives relate to stimulation of economic growth, through accessibility improvements or the creation of an enhanced image for the area.

It is quite common for scheme objectives to evolve after the appraisal is completed and the scheme has been approved. For example, congestion relief impacts of a public transport scheme may be replaced by emphasis upon improvement in access to facilities for those without a car available. Priorities external to transport can also change, leading to new priority areas that transport must support. Whilst it is appropriate to evaluate also against these revised objectives, it is strongly recommended that the objectives addressed by the Appraisal should have priority.

All major transport schemes are now subject to a Strategic Environmental Assessment (SEA). The primary purpose of an SEA is to ensure that environmental considerations are at the heart of project thinking. In the past it has sometimes been the case that, whilst environmental impact is appraised once the broad concept of the scheme has been defined, environmental considerations and opportunities do not play a proactive part in the scheme development process.

In general there should be consistency between the SEA and the other sets of objectives discussed above (though an evaluation could appropriately check that this is the case). However, it is a distinct possibility that an SEA could contain specific environmental objectives for a scheme that do not appear under other headings. This is particularly the case for more detailed environmental objectives.

Table A.1
Illustrative Appraisal Summary Table for a Local Authority Major Scheme

Year 2016

| | |
|-------------------------------------|--|
| ENVIRONMENT | |
| Noise | <i>Slight beneficial.</i> The predicted number of people annoyed by road traffic noise is approximately 2% lower than for the Reference Case. |
| Local Air Quality <i>General</i> | <i>Neutral.</i> Implementation of the Scheme is predicted to result in the vast majority of the population in LTP area experiencing a negligible change in air quality. |
| Air Quality Management Areas | <i>Neutral.</i> Though more of the population in AQMAs are exposed to improvements rather than degradation. |
| Greenhouse Gases | <i>Slight beneficial.</i> The scheme gives rise to a decrease of 14 kilotonnes per year, or a 2.3% reduction when compared to the Reference Case |
| Landscape | <i>Slight adverse.</i> Potential park-and-ride sites are located close to sites designated for their landscape importance. |
| Townscape | <i>Slight adverse (potentially).</i> The locations for new pedestrian and cycling infrastructure related to the scheme have not been identified. Thus there is potential for some negative affects, though good design would offset this (and the provision of such routes would increase access to and appreciation of townscape amongst the population). |
| Heritage of Historic Buildings | <i>Neutral.</i> The detailed design of potential park-and-ride sites will need to pay particular attention to this issue. |
| Biodiversity | <i>Slight adverse.</i> Two of the potential park-and-ride sites are located adjacent to Wildlife Sites (though there is potential for mitigation through landscaping, to be considered at a detailed design stage). |
| Water Environment | <i>Neutral.</i> There is potential for polluted run-off associated with park-and-ride sites, though this can be largely offset by good practice design measures. |
| Human Fitness/Health | <i>Moderate beneficial.</i> Beneficial effects on community health and lifestyles are expected through the walking and cycling components of the scheme |
| Journey Ambience | <i>Large beneficial.</i> The impact of the strategy is likely to be significant in terms of traveller care - i.e. facilities, information, cleanliness etc. There would also be benefits in terms of traveller stress - reduced fear of accidents, less frustration resulting from increased travel reliability etc. |
| SAFETY | |

Year 2016

| | |
|--------------------------------|--|
| Accidents | <i>Moderate Beneficial.</i> Significant reductions in both killed and seriously injured (KSI) and minor casualties. Minor casualties reduced by 6%, KSI reduced by 5%. Accident saving of £19m. |
| Security | <i>Moderate Beneficial.</i> The Scheme includes investment in security measures, such as lighting on walking and cycling routes, which will assist in improving personal security. Greater use of walking and cycling, and of public transport, will increase the level of natural surveillance that occurs on the streets, thus impacting positively on actual and perceived personal security. |
| ECONOMY | |
| Public Accounts | See separate Public Accounts Table [of public expenditures and revenues] |
| Business | See separate Economic Efficiency of the Transport System (TEE) Table |
| Consumer Users | See separate TEE Table |
| Reliability | <i>Slight Beneficial.</i> Reductions in volume to capacity ratios on the highway system, and segregated public transport, walking and cycling routes |
| Wider Economic Impacts | Not quantified. The scheme is expected to generate major investment in the city centre, leading to wider economic benefits in terms of agglomeration, more people working and a move to more productive jobs. |
| ACCESSIBILITY | |
| Option Values | <i>Moderate Beneficial.</i> Positive impact, particularly in the urban areas, through investment in new public transport option, walking and cycling as alternatives to the car mode. |
| Severance | <i>Moderate Beneficial.</i> The scheme involves substantial investment in facilities for walking and cycling, and allows many crossing points of an alignment that has to date been a major barrier |
| Access to the Transport System | <i>Moderate Beneficial.</i> Greater access to the transport system is promoted by the Scheme through provision of a new high frequency service and standard fares, and through investment facilities to assist walking and cycling (which have very low user costs). |
| INTEGRATION | |
| Transport Interchange | <i>Moderate Beneficial.</i> Improved conditions for interchange arise from investment in park-and-ride facilities targeted at car and cycle users, and through measures in the City Centre to integrate the Scheme with the existing bus system, through provision of a city centre loop line. |

Year 2016

| | |
|----------------------------|--|
| Land-Use Policy | <i>Moderate Beneficial.</i> The scheme seeks to support the local land-use policies through promotion of alternative modes to the private car (i.e. new public transport, walking and cycling) combined with limited car travel demand restraint. The overall effect of the Strategy would be to make City Centre and local centres more accessible relative to development sites for which car travel is the only viable option. The approach would not eliminate pressures for out of town developments, as car will remain the dominant mode, but should help to reduce them. |
| Other Government Policies | <i>Slight Beneficial.</i> The Scheme would bring benefits in terms of social inclusion (through investment in universally available modes of travel) and health (through the emphasis on walking and cycling). |
| SUPPORTING CRITERIA | |
| Affordability | The revenues from the public transport (and park-and-ride) components will cover all public transport, walking, cycling and environmental operation and maintenance costs. Maintenance of the complete scheme is a condition of the concession. |
| Financial | As above, the Scheme will generate sufficient revenue for maintenance and renewal, and this is an obligation on the concessionaire. |
| Public Acceptability | All consultation undertaken indicated strong support for the Scheme, both locally and regionally. There are no outstanding objections from those directly impacted by the scheme. |
| Practicality | All issues of engineering feasibility and interaction with road traffic have been satisfactorily resolved. |
| Distribution and Equity | Use of the Scheme is likely to be predominantly by consumers, though business use of the park-and-ride facility is likely to be significant. The highway decongestion and reliability benefits will accrue to business, consumer and freight travel. |
| Deliverability | See practicality. |

Box A.1

Example of Local Transport Plan (LTP) Objectives

- To effectively manage the transport network to provide network efficiency, reduce unnecessary delays and facilitate economic activity.
- To maintain and improve the transport infrastructure.
- To develop and maintain a combined land use and transport system that provides good access to key facilities and services for all residents and visitors to the LTP area, particularly those from disadvantaged communities.
- To maintain and improve accessibility to key facilities for pedestrians, cyclists and bus users and particularly for disadvantaged people.
- To reduce road accident casualties, particularly for vulnerable road users and disadvantaged communities.
- To maintain and improve transport and community safety and security, including reducing perceived danger.
- To enhance air quality in the LTP area, particularly within the air quality management area.
- To contribute towards reducing the UK's transport impact on climate change.
- To promote and encourage healthier and more sustainable travel choices.
- To improve environmental conditions for communities in the LTP area by reducing the adverse effects of transport and enhancing the sense of place through greater social interaction and natural surveillance.

Source: Derby Joint Local Transport Plan (provisional) 2005

LTP and scheme specific objectives may define specific problems in an area. These can range from the general (e.g. reduce congestion) to the specific (e.g. prevent excessive queues building up at junction X). It is often an objective that schemes contribute towards the achievement of specific targets set by the LTP. An impact evaluation could appropriately address all of these issues.

Appendix B. Impact Data Collection Techniques

This Appendix describes and discusses the techniques available for collection of data for an impact appraisal. It is structured as follows:

- General principles: types of traveller survey; cross sectional and longitudinal surveys; sampling and bias; choice surveys; focus groups and other qualitative surveys.
- Surveys of personal travel: household surveys; traveller interception surveys.
- Data collection for freight.
- Network volume and performance surveys: manual methods; continuous and automated data sources.
- Developer and planning data.
- Environmental data.

B.1 General Principles

B.1.1 Types of traveller survey

Transport surveys are generally used to obtain two types of data:

- information on a specific trip or on trips made over a specified period; and
- information on attitudes to transport.

The former will be *quantitative* and concerned with numerical data and statistics, whereas the latter will be mainly *qualitative* using words to describe people's views and other factors that influence their travel decisions.

When deciding what type of data to collect, it is important to consider what form of evidence is required and when. It will help to answer the following questions:

- What do you need to know?
- What is the time scale for the evaluation?
- How will the fieldwork (data collection) be done?
- How much funding is available?

A mix of quantitative and qualitative information is often used in evaluation, for example, to measure the extent of a problem (quantitative), determine who is affected (quantitative), why the problem arises (qualitative), how it affects people (qualitative), whether the policy intervention will make a difference (quantitative), and what people think of this solution (qualitative).

It is possible to combine data collection for these two types, particularly where the interview times are not constrained.

B.1.2 Cross sectional and longitudinal surveys

A primary division for data collection is between cross-sectional and longitudinal.

Cross sectional surveys provide a picture of the situation at a given point in time. Regardless of the scale of such surveys, an individual cross sectional survey does not provide any detail as to how the observed situation arose and about ongoing trends and their causes.

Cross-sectional surveys that are repeated on a regular basis provide more information on trends, particularly if conducted frequently. However, there is still no information directly provided on the causes of change. This can only be inferred through techniques such as statistical analysis or by postulating and calibrating models.

Longitudinal surveys are characterised by the tracking of individuals through time, typically as members of a household unit. Travel behaviour is recorded along with a wealth of information about other life-events, such as starting or leaving school, changing job, marriage, buying a house, having a first or second child, retirement etc. Of particular interest in such surveys will be the nature, scale and timing of responses to the introduction of a transport scheme. Longitudinal surveys are of particular value in tracking the impact of schemes through the settling down period and the initial after period.

Most longitudinal surveys do not constitute continuous data collection. Participants are re-contacted at regular intervals, when life-changes in the intervening period and a new round of travel behaviour are recorded. Nevertheless, such surveys present long term management issues. Participants in the surveys form a panel, and these techniques are often referred to as panel surveys. Members of the panel need to be tracked when they move residential location. When panel members move out of scope (e.g. through movement of residence out of the area of interest) they need to be replaced by randomly selected new members.

B.1.3 Sampling and bias

Clearly it is not necessary to collect all data by census. It is possible to provide estimates based on a relatively small sample of the population. Quite how small depends on:

- How precise the estimates need to be;
- Whether there are sub-groups that need to be estimated separately;
- Whether **differences** between sub-groups are of interest; and
- If there is any interest in changes over time.

Using a sample, rather than the whole population, introduces chance effects, known as "sampling error". This can be reduced by increasing the **sample size**, but beyond a certain size collecting more data does not improve the precision of the survey estimates to any great extent.

It is also important to note that the precision of survey estimates is dependent on the absolute size of the sample, rather its size relative to the population. For example, the precision of estimates from a survey with a sample size of 2,500 is the same, regardless of whether it is from a population of 10,000 or 100,000. (Where population sizes are very small this does not necessarily apply, but this is not generally an issue in transport surveys.)

For example, mobility impaired bus users may be expected to make up about 5,000 (5%) of a town's population of 100,000, but a precise estimate of numbers is required. A random sample of 2,000 would estimate the true proportion to within 1 percentage point. So if the survey's central estimate of the proportion of mobility-impaired bus users turned out to be 5%, the true proportion would be almost certain (95% probability) to lie in the range 4% to 6%, and the actual number between 4,000 and 6,000.

Doubling the sample size to 4,000 would reduce the maximum error to about 0.7 of a percentage point, and the true proportion would be almost certainly between 4.3% and 5.7%, with the actual number between 4,300 and 5,700. This illustrates how it can be expensive to purchase high levels of precision through increases in sample size.

Crucially, the accuracy of these estimates depends upon all residents of the town having an equal chance of being subject to observation - i.e. that the sample is truly random.

Other methods of sampling can reduce the survey costs, but at the expense of accuracy. The following sections discuss stratified sampling, quota sampling and clustering. Further guidance on sample size and bias using these methods is available from a variety of sources.²⁵

It may be possible to make the sampling more efficient by **stratifying** the population into segments with similar characteristics (e.g. age, income). As there is probably less variation **within** each segment than in the overall population, it is only necessary to take a small random sample from each to get a precise estimate of total. The estimates for the individual strata could then be combined to get an estimate for the whole population.

The advantage here is that survey effort can then be concentrated on the variables and population sub-groups of most interest to the study, where accuracy of estimates is most critical. For example a survey to be used as an input to car ownership forecasting may deliberately over-sample better-off areas of a town so that the sample size for 3+ car owning households is relatively high. In a truly random sample not many of these households would be observed, but the importance of this segment to future travel behaviour may be very significant.

Of course, the relative sizes of the selected strata in the population must be known, so that the results of the individual strata can be combined to represent the whole population.

An alternative to structured random sampling is the technique of **quota sampling**. Again the population is divided during survey design into segments. Data collectors then aim to obtain data from a pre-determined number of people or households within each segment. The process of approaching people/households for interview is often left up to the data collector, and is not therefore strictly random in nature, and for this reason the government has tended to advocate random sampling.

However quota sampling methods can be cheaper and faster. For example, in the context of a household survey, all of the respondents in a particular group could be obtained by interviews carried out in a single street, thus greatly reducing interviewer travel time and costs. The non-random effects can be corrected to some extent by "post-weighting" to known segment sizes in the population (as with stratified sampling), and quota sampling has the further advantage of allowing hard-to-reach groups to be targeted.

A further variant commonly used in transport surveys is **cluster sampling**. Here a survey area is divided into zones. A sample of zones is drawn such that in aggregate the sample has the same characteristics (e.g. age structure, income, car ownership) as the population. **Random** samples are then drawn **within** each selected zone. The purpose of this approach is to make better use of survey resources, avoiding the high costs of travel associated with a truly random sample drawn across a large urban area. However, the disadvantage is that the sampling error is increased and a larger sample size is therefore required for estimates to be as precise as with an unclustered survey.

The desirability of a truly random sampling system is self evident. There are however many pitfalls to the achievement of this. Two fundamental issues related to survey methodologies in transport are discussed in detail below. These do not form a comprehensive list, rather they are pointers to indicate the importance of this issue.

An important distinction in surveys of travel behaviour is between:

- surveys that involve direct interviewing of randomly selected persons; and
- surveys based upon willingness of individuals to complete and return questionnaires.

The second method suffers much more significantly than the first from the problem of non-response bias (i.e. from those not responding having differing behaviour and viewpoints from those who do). Non-response bias is a particular problem with surveys of urban bus usage, where the proportion of questionnaires returned is quite often as low as 15 per cent. Steps should be taken to minimise this

²⁵ Notably *The Magenta Book: Guidance Notes for Policy Evaluation and Analysis*, Cabinet Office, July 2003

effect in survey design, and analysts should allow for the probability of bias when interpreting the results of low response surveys. A means to correct for non-response bias should be identified before employing self-completion techniques (e.g. a limited number of parallel interview based surveys, or ways of relating the sample to a full population) otherwise use of the technique should be rejected.

Where direct interviewing is involved, interviewers should be trained in techniques to avoid the potential for introduction of bias in selecting people to approach. Even then there remains the question of "contact bias". This is especially important for transport- and mobility-related surveys carried out at home, because the likelihood of being in when the interviewer calls is obviously least for those individuals who travel most! It is good practice, therefore, to allow for several call-backs at the same addresses at different times of day and week to capture more mobile people in the survey.

B.1.4 Choice surveys

Choice surveys, such as Stated Preference (SP) techniques, are commonly used at the appraisal stage of a project to help in the development of forecasting models. They are of particular value where new options are being considered. Their contribution to evaluation is much less since, where models are to be developed to understand what has happened, it is revealed preference data, i.e. observations of choices actually made, that are a prime requirement.

However, there is potentially a role for choice surveys in gaining an understanding of why the observed pattern arose, as they are capable of obtaining much more detail than other methods about trade-offs made by people or businesses between alternatives actually or potentially facing them. For example, by estimating the relative valuations that different (categories of) users attach to changes in average journey time, journey reliability, safety and security, ambience etc, a more comprehensive explanation may be obtained of factors that have influenced behavioural responses (which have been revealed by the pattern of take-up for the new versus existing transport options, for example).

Findings from SP can also help to identify the *perceptions* of benefit among scheme users, residents, and/or the general public. For example, surveys carried out at stages before implementation of London's congestion charging scheme collected data on car drivers and residents anticipated behavioural responses, and their expectations (positive and negative) about impacts of the scheme. Actual responses and perceptions were also recorded at stages afterwards. Comparing expected and actual/perceived impacts can help to identify subjective benefits, since - as most theories of consumer satisfaction recognise - satisfaction is a function of actual relative to expected experience. To date, however, these approaches have been applied as tools for monitoring (which may including a role in detecting adverse impacts on particular groups and guiding adjustments to the scheme to ameliorate them) and in process evaluation, as distinct from impact evaluation.

B.1.5 Focus groups and other qualitative surveys

The most frequently used qualitative methods are focus groups and in-depth interviews. The rich data collected can be used to understand how, why and under what conditions schemes are successful (or fail to meet their objectives). Therefore qualitative research tends to be used most in process evaluation to explain:

- the nature of the scheme;
- how it was developed; and
- how it was implemented.

This information helps investigators to make judgements on the efficacy of the sponsor organisation and the delivery mechanisms. However, qualitative research can also be used in impact evaluation to help explain:

- the range of outputs and outcomes; and
- how these interact.

Qualitative research amongst hard to reach groups (e.g. people from ethnic backgrounds) often makes up for under-representation in quantitative surveys and helps to give a more complete understanding of the impacts across the local population.

Focus groups tend to include about eight participants and a moderator who poses the initial questions and "manages" the ensuing discussions. They are an ideal opportunity to bring together those involved in the development of a major scheme to share their experiences, exchange ideas, and consider how they would approach it differently in the future. Individual depth interviews are better for eliciting more personal or sensitive information that may have affected aspects of the design, programme and delivery.

B.2 Surveys of Personal Travel

This sub-section is concerned with surveys of travel by people, including the use of private vehicles (as opposed to the movement of freight). The primary purpose of such surveys is to understand trip making (as opposed to aggregate travel volumes that can be picked up by roadside observations or counts of public transport passengers).

An important secondary purpose of surveys of person travel is collection of information on attitudes to transport related issues. It is sometimes appropriate to carry out additional/separate surveys for this purpose, in order to avoid complicating the collection of data on trips that have been made.

A primary distinction in surveys of person travel is between:

- household travel surveys; and
- traveller interception surveys.

The former, as would be expected, is concerned with travel made by persons within a household. The latter involves collecting data from people as they are travelling, primarily about the trip that is being made at the time of interception.

The type of data on trips obtained from such surveys is broadly similar, as a minimum including:

- time of journey;
- origin location and purpose;
- destination location and purpose;
- modes of travel (main mode, access and egress modes); and
- car ownership or car availability.

B.2.1 Household surveys

The particular issues about household surveys that are of relevance to data collection for impact evaluations are set out below.

Household surveys include only trip making by residents in the surveyed area, and hence provide no information about trip making to and from the area by other persons, or about through trips.

Household surveys are suitable for both cross sectional and longitudinal survey methodologies.

Household surveys are labour intensive and hence tend to have high unit costs. This restricts the size of sample that can be obtained (assuming that self completion options are rejected on data quality grounds). Therefore, such surveys are generally unsuited to the purpose of building origin/destination trip matrices for use in transport models. However, they can provide a wealth of data on trip making rates, by parameters such as household structure, car ownership and income, for use in forecasting. When combined with travel cost (time and money) data from transport network models, trip data from household surveys can be used in the calibration of travel demand models.

Household surveys are an inefficient way of building up a picture of usage of a particular scheme. Even if undertaken only in the scheme corridor, most trips observed will not be scheme related. This is particularly the case for public transport schemes which have a low mode share, but also applies to car.

A particular point to note about household travel surveys is that trips for all adult members of each selected household need to be recorded.

B.2.2 Traveller interception surveys

Traveller interception surveys focus on the trip that is being made at the time of survey. The main types of traveller interception surveys are as follows:

- roadside interviews;
- car parking surveys;
- surveys on public transport vehicles; and
- surveys at public transport stops.

The purpose of roadside interview surveys (RIS) is to obtain data on car and goods vehicle trip making at particular points on the road network. The main use of such data is in the construction of matrices of trips for use in transport models. Because of traffic safety and concerns related to public relations, an individual roadside interview survey (RIS) is a highly formalised process, for which there is a wealth of regulation and guidance. Safety and avoidance of excessive delays to traffic are the primary concerns, and all sites require a police presence at all times. There are large number of experienced travel survey companies who specialise in RIS.

The particular issues about RIS that are of relevance to data collection for impact evaluations are as follows:

- Individual sites need to be grouped into screenlines and cordons, such that all traffic crossing is subject to interview.
- Sites can generally only be operated in one direction, and hence data for the reverse direction needs to be synthesised from that for the forward.
- A considerable degree of effort needs to be put into data checking, and in particular ensuring that there is minimal data loss. A particular issue is ensuring that all origin and destination addresses are correctly allocated a postcode, from which an Ordnance Survey grid reference can be obtained.
- RIS do not observe movements that do not cross survey screenlines and cordons, and hence trip matrices built from them are partial in nature. Model based techniques to infill these matrices need to be applied. Increasing the number of screenlines increases accuracy of trip matrix estimation, but adds to costs.
- Problems do occur with RIS that can lead to suspension of surveys for parts of the day. It is not usually practicable to undertake repeat surveys, and so data synthesis processes need to be applied

Car park based surveys of personal travel are generally only suited to urban centre locations, and to public parking. Outside of town centres, parking activity is too geographically diffuse and a high proportion is residential or private off street (to which access cannot easily be gained). Even within urban centres interviews of owners of parked vehicles provide very partial information. The main deficiencies are:

- even in an urban centre off-street private parking can account for a very substantial proportion of parking, and it is generally impossible to survey such locations; and

- parking surveys do not observe through traffic or traffic that parks only for a very limited duration (e.g. couriers parking in restricted street locations).

In general it can be considered that car park surveys of person travel are, at best, a supplement to other data sources such as roadside interview surveys.

Person travel surveys on public transport vehicles are particularly effective where data on specific routes or corridors are required. The data are generally used for trip matrix building, though collection of attitudinal data is also a common objective. A key point to note is that permission from the relevant operator is always required. The survey process involves interview with passengers as they travel, combined with boarding /alighting counts at stops, and occupancy counts at key locations as the basis for expanding the sample of interviews.

Sampling of passengers is a major issue for such surveys. With direct interviewing there can be a tendency to over sample long distance riders, and under sample those only travelling a few stops. This problem is not easily avoidable. Self completion methods, combined with both on-vehicle collection of questionnaires and a facility for postal return, are often used to try to overcome this problem. However, the issue of non response bias in such surveys, as discussed earlier, remains.

Interview surveys at public transport stops are often carried out for the purpose of trip matrix building. Such surveys are best conducted by direct interview methods. However, there is some concern that those arriving at stops just before the departure time, and hence not likely to be interviewed, are likely to have different characteristics (e.g. they may be regular travellers with detailed timetable knowledge). Issuing of self completion postal return forms to this group of travellers is often considered.

It is only considered practical to interview passengers waiting to board services. Alighting passengers will not generally stop for interview. This means that survey data from stop surveys will need to be transposed to represent travel in the opposite direction. Counts of passengers boarding and alighting at each survey stop are therefore required.

Surveys at public transport stops are considered cost effective for:

- surveys of usage of whole networks with a limited number of well used stops (e.g. local heavy rail systems or urban Metro systems); and
- bus stops within town centres.

Surveying at all bus stops is not cost effective as many are very lightly used. A bus stop cordon survey observes all passengers travelling to, from or interchanging within the defined survey area. In a typical town this could capture as much as 70 per cent of passenger movements. Trips not observed by the surveys can be obtained by a variety of methods, notably from electronic ticket machine data as discussed below, and from transport model based synthetic processes.

B.3 Data Collection for Freight

Information on the movement of goods by road can be picked up in the same surveys as those for person travel by road, most notably roadside interview surveys (RIS) and traffic counts. Even where the scheme in question is targeted exclusively at person travel, such as a new piece of light rail infrastructure, it is recommended that interviews of goods vehicles are included in RIS unless there are compelling reasons to omit them. Traffic data collected in respect of a public transport scheme evaluation needs to be comprehensive, in order to facilitate activities such as traffic modelling and hence the estimation of the congestion benefits from transfers from car to public transport.

The importance of a detailed understanding of road goods movement would be much greater if, for example, a scheme for establishment of a trans-shipment centre to eliminate heavy goods vehicles from urban streets was the focus of the evaluation. Here specialist surveys would be required that allowed an understanding of parameters such as the type of goods carried and the requirements for delivery timing and frequency.

It is rarely the case that information on freight movements other than by road will be required in the context of a local authority major scheme evaluation. The exception would be a scheme specifically targeted at encouraging rail or water born freight movements, such as new inter-modal transshipment facilities.

Behavioural understanding (and hence modelling) for freight movement is underdeveloped by comparison with person travel. This often means that qualitative techniques rather than statistical analysis or model estimation based approaches are needed to understand the response of operators and their drivers to a new scheme. Structured discussion sessions and focus groups are the types of data collection tool most likely to be appropriate in this respect.

B.4 Network Volume and Performance Surveys

B.4.1 Manual methods

A number of travel data collection techniques based upon manual observations are in widespread use. These include:

- highway journey time surveys, using the "moving car observer" or roadside observation techniques;
- bus journey times, on-vehicle or roadside observation;
- manual traffic counts classified by vehicle type, on highway links and for turning movements at junctions;
- parking arrival, departure and occupancy counts, at on-street, public off-street and (if practical) private off-street locations (noting that this survey type is generally cost effective only in urban central locations); and
- public transport passenger counts:
 - boarding and alighting at stops (generally only cost effective for town centres); and
 - vehicle occupancy across cordons and screenlines

B.4.2 Continuous and automated data sources

In recent years there have been considerable development in use of information extracted from data sets collected on a continuous or semi-continuous basis. Many of these sources are related to continuous monitoring by local highway authorities (e.g. in relation to the LTP process) or the Highways Agency. Others are related to revenue collection. These sources are identified and described briefly below. It can be expected that opportunities for new methods will continue to arise as the capability of information technology increases, and unit costs are reduced.

B.4.2.1 Automatic traffic data recording

Examples of automatic data collection in respect of road traffic are set out below.

- Obtaining counts of vehicle movements via automated systems is standard procedure. Increasingly such systems are able to distinguish between types of vehicle (i.e. they can produce "classified counts");
- Automatic Number Plate Recognition (ANPR) is a relatively new technique involving use of traffic cameras at strategic locations, and specialist recognition software to identify individual vehicles and track them through the network. Wider usage and technological improvements to such systems can be expected. The output is a set of vehicle origin to destination trip matrices for the area covered by the camera locations. The level of vehicle type classification is dependent upon willingness of the Driver and Vehicle Licensing Agency (DVLA) to allow observed number plates to be matched with their vehicle records;

- MIDAS - a system for estimating count and flow data at 500m intervals on major roads such as motorways.

B.4.2.2 Outputs from revenue collection systems

Examples of use of outputs from revenue collection systems are set out below

- Electronic Ticket Machine (ETM) systems for public transport are now a widely used source of data for transport related studies. They can provide both volumetric information and information on passengers' origins and destinations. Except where contractual conditions related to a concession apply, their availability is dependent upon operator cooperation. This is usually forthcoming subject to satisfying concerns about commercial confidentiality. ETM outputs can offer a 100 percent sample of passenger travel over a specific period. However, limitations apply to such data in respect of generation of matrices of trips that require them to be combined with other data sources. These limitations include:
 - poor geographic resolution of trip ends due to the need to base origins and destinations on fare stage, fare zones or rail stations;
 - treatment of trips involving interchange as two wholly separate trips (a problem that is mainly a problem for bus ETM data sets); and
 - absence of information on the purpose of the trip (though person type differentiation by broad age category is often available).
 - data sets from parking revenue collection systems are most commonly available for town centre locations, for both on-street and off-street parking. Where off-street parking is provided by private companies, there would be a need to seek permission and perhaps cover any processing costs. Data from this source is generally very accurate for volumes of arrivals, but the nature of the pricing structure means that departure times can often be approximate except where barrier payment systems are in place.
 - Road user charging systems have the potential to provide data on traffic movements in a variety of ways, depending on the nature of the revenue collection system. For example, for an area-based system using vehicle number plate recognition it may be possible to distinguish between "destinating" and "through" traffic at each entry point, and then to relate this information to other data sources in order to assist in the creation of trip matrices.

B.5 Developer and Planning Data

The important impacts of transport schemes can spread much more widely than just to transport and traffic. This may be in terms of one or more of the following:

- Land use change;
- Demographics/ household characteristics;
- Economic characteristics;
- Social exclusion;
- Environment; and/or
- Property market.

What is the geographical area over which the impacts should be measured?

This depends upon the objectives of the scheme. Generally, where regeneration, economic development, or other wider objectives are critical to the success of the scheme some wider exploration of the spatial impact may be necessary, having regard to the need, as noted in section 4.3 above, to take note of unexpected impacts.

A scheme designed to promote widespread regeneration may require evaluation of impacts over the whole of an urban area (as in the evaluation of Manchester Metrolink Line 1). This would ensure measurement of the overall impact, and not simply a displacement of growth from one part of the urban area to another.

Other schemes may require an assessment of the impacts along a transport corridor. This would apply where the objectives were couched in terms of regeneration of specific areas, or where the scheme was concerned with improving traffic flows or accessibility along the specific corridor.

Finally some schemes may have objectives that are focused on a tightly defined area, for example around a transport interchange. It may be appropriate in such instances to consider only a relatively small geographical area.

What data sets are available to help with determining land use change and other wider impacts?

Table B.1 summarises the main data sets that are available, and that can assist with the analysis of the wider impacts.

Table B.1
Data Sources Relevant to Land Use Change and Other Wider Impacts

| Theme | Data Source |
|---|--|
| <i>Land use change</i> | <ul style="list-style-type: none"> ■ ODPM floor space statistics ■ NLUD ■ Local Authority Surveys |
| <i>Demographic /household characteristics</i> | <ul style="list-style-type: none"> ■ Census statistics ■ Local Planning Authority estimates |
| <i>Economic characteristics</i> | <ul style="list-style-type: none"> ■ Annual Business Inquiry ■ 2001 Census ■ Local Authority surveys ■ Unemployment Statistics |
| <i>Social exclusion</i> | <ul style="list-style-type: none"> ■ Index of Multiple Deprivation ■ Benefit Data |
| <i>Environment</i> | <ul style="list-style-type: none"> ■ Local authority air monitoring ■ Built environment surveys ■ Natural environment surveys ■ Environment Health Noise complaints monitoring |
| <i>Property market</i> | <ul style="list-style-type: none"> ■ Land Registry statistics ■ Local house price monitoring ■ Local rent monitoring |

Information can be accessed via a range of sources. These include:

- **Office of National Statistics** (www.statistics.gov.uk). This is the key source for most nationally produced data sets. The site provides access to 2001 Census material and to Neighbourhood Statistics. The latter is a growing collection of local data, that covers a range of demographic, economic, social and deprivation measures.
- **Other government departments**. Several departments provide downloadable information on their websites. Most noticeably, in this concept is the information provided on the Office of the Deputy Prime Minister's website. This includes floor space statistics, the national land use database (NLUD), planning and housing returns.
- **Nationwide data archives**. There are several data archives that have been developed to meet the information needs of specific professions. For example Dataspring (www.dataspring.org.uk) which maintains a range of housing market databases at national, regional and district level. It is recommended that evaluation managers discuss their wider information needs with housing, planning and other local authority officers.
- **Regional Observatories**. A network of regional observatories has been established across the English Regions. These are a source of regional intelligence relating to economic, social and environmental issues. (www.regionalobservatories.org.uk).
- **Local Observatories**. Several local observatories have been established. These typically aim to provide detailed information on economic, social, demographic and environmental matters.
- **Local Authorities**. Local Authority departments contain a wealth of statistical and administrative-based information. Often, this has been collected with some other purpose in mind, for example the preparation of the Local Development Framework's annual monitoring statement or to provide the evidence base for a Housing Strategy.

A potentially very useful reference data source is the ODPM publication *Neighbourhood Renewal, Final Report*, February 2006. This document signposts the datasets available for targeting, monitoring, priority setting and performance management at a neighbourhood level. The report highlights the main datasets by theme, with initial sections on population, multiple deprivation and low income, followed by sections on each of six key target areas: employment and enterprise, education and skills, health, housing, crime and community, education and skills, health, housing crime and community safety and liveability.

What time period should be considered for wider impacts?

- Land use/ economic change can be longer term;
- Publicly available data sets often delay in their publication;
- Thus may need to consider a fairly long time horizon.

B.6 Environmental Data

Direct measurement of environmental impacts is a specialist area for which appropriate organisations will generally need to be employed to carry out the work. In terms of transport scheme impacts the term environment encompasses a very wide area, including noise, local air quality, greenhouse gases, landscape, townscape, heritage of historic building biodiversity, and water environment. Physical fitness and journey ambience can also be considered under these headings.

A particularly important factor is to ensure that, where appropriate, any surveyed environmental impact can be related to forecasts of transport movements. Again this is because in many cases the situation without the scheme (the counterfactual) cannot be observed, and must in some way be forecast (by trend based methods or by modelling). An example of this is road traffic noise. This can be directly measured for the Before and the After, for critical locations, but not for the counterfactual. Impacts based upon road traffic estimates will therefore need to be calibrated to the observed impacts.

Appendix C. Transport and Land Use Modelling

C.1 Transport Models

Transport models can have a number of components. Key modules and their value to evaluation are:

1. Road Traffic Assignment (route choice) Network Models - Representations of the Before and After situations allow changes in key indicators such as congestion and traffic related environmental impact to be quantified. Traffic assignment models are a necessary input to any wider demand modelling (e.g. of mode or destination choice), but do not in themselves have this capability.
2. Public Transport Assignment Network Models - A necessary input to demand modelling, but do not add greatly to the level of information that can be obtained from conventional analysis of travel surveys and patronage data from operator revenue systems.
3. Mode Choice Models - A limited form of demand modelling that considers change of mode to be the only response other than route choice. Often used to forecast the patronage of new public transport schemes in the appraisal stage. Such models are only of value to evaluation if other important responses such as destination choice can be assumed to have minimal effect.
4. Comprehensive Demand Models - Typically encompass choice of frequency, destination, and mode (and increasingly time of day is considered), providing a basis for forecasting the Counterfactual.

The critical stage in the development of transport models is that of obtaining a reliable estimation of trip making (demand). Good quality survey data as discussed in previous sections is a necessary starting point. Further stages include:

- building matrices of surveyed movements (generally called partial matrices);
- estimating none-surveyed movements, e.g. from older data, public transport or car park revenue system outputs, or through synthetic techniques such as gravity models; and
- adjusting matrix estimates so that modelled flows accord with observed counts.

The last stage in the above (and the second stage where data synthesis techniques are employed) require a good quality representation of the transport network. Building networks requires fundamentally less skill than construction of demand matrices, but attention to detail is necessary in order to avoid distortions in stages two and three above.

Transport models are validated by two primary means:

- the ability to replicate a base year situation (in terms of person and vehicle flows and highway journey times); and
- the ability to replicate observed travel cost elasticities, notably road traffic in relation to fuel cost, and public transport trips in relation to fares.

Transport models are created from a wide variety of data sources via complex practices. As a result, as was noted in section 4.4.1 of the main text, it is not usually practical to create measures of confidence in their outputs, such as would be available from statistical analysis of the underlying data sets.

A technique of particular concern to impact evaluation is that of model estimation. For example, demand models estimated from demand and supply representations of the Before and After situation can be used to estimate the counterfactual.

A selection of guidance sources for the creation, use and applicability of transport models is provided in Box C.1.

Box C.1

Reference Works for Transport Modelling

WebTAG - DfT Transport Analysis Guidance (as at January 2006):

Guidance Documents

- 3.1 Modelling (Expert Level)
 - 3.1.2 Transport models
 - 3.1.3 Land-use/Transport Interaction Models
- 3.11 Specification, Development and Use of Models for Major Public Transport Schemes

Consultation Documents

- 2.9.1 Variable Demand Modelling - Advice Overview
- 2.9.2 An Introduction to Variable Demand Modelling
- 3.10.1 Variable Demand Modelling - Preliminary Assessment Procedures
- 3.10.2 Variable Demand Modelling - Scope of the Model
- 3.10.3 Variable Demand Modelling - Key Processes
- 3.10.4 Variable Demand Modelling - Convergence Realism and Sensitivity

Design Manual for Roads and Bridges (DMRB) - Department for Transport.

Modelling Transport - J D Ortuzar and L G Willumsen - John Wiley and Sons 1990.

Guideline for Urban Transport Strategies (Chapter 5 - Models for Transport Strategy Development and Appraisal) - Institute of Highways and Transportation, 1996.

Handbook of Transport Modelling, Hensher D, Button K, - Pergamon 2000.

DETR (March 2000), *Guidance on the Methodology for Multi-modal Studies, Volume 2, Appendix B*, HMSO.

C.2 Land-Use and Land-Use/Transport Interaction (LUTI) Models

Land-use/Transport Interaction models (LUTI models) represent a more comprehensive approach to modelling than the transport models discussed above. *Land-use models* are primarily concerned with forecasting the locational decisions of population and activities, and of new physical developments. By linking land-use to transport models, one is moving from a position where:

- land-use change is entered (into the transport model) as exogenous change; to one where
- the forecasts of land-use are generated according to inputs on land-use policy, and changes in accessibility derived from the transport model.

Advantages of LUTI models over transport models alone in the *appraisal* process are that:

- they provide more detailed and more systematically defined land-use inputs to transport forecasting, for different economic scenarios and for different land-use policies; and
- they forecast the land-use/economic consequences of transport schemes and policies.

As with transport models alone, land-use or LUTI model applications provide the potential to assist in defining a "counterfactual" situation in relation to a major transport scheme. This would be most applicable (i.e. cost effective) where land-use modelling or LUTI techniques had been used in the scheme appraisal process. The process would involve adjustment of land-use model parameters such that directly observable land-use impacts between the Before and the After situations were replicated. Following this a wealth of additional detail (albeit estimated rather than observed) would be available to inform the evaluation process, and an indication of the scope of this is provided in the discussion below. Even if a full re-calibration to observed data was not affordable, use of an existing land-use or LUTI model to provide insights into scheme impacts, which could then be at least partially checked by observations, could be of benefit to an evaluation.

The term "land use" is taken to mean a range of human activities, the state of the built environment and also some aspects of the natural environment. As such it is a much broader definition than merely land and is concerned with households and population, employment, building stocks (including housing and commercial units) and their numerous interactions.

The term land-use, and the models that represent it, is concerned with a number of different categories of "actors". These are the groups, whose decisions are both influenced by and influence the location of activities and the interaction of land and transport. The three main categories of actor are:

- the population, as individuals and as households;
- firms and other productive organisations; and
- government.

Three other categories of interest are:

- property developers;
- transport infrastructure providers; and
- transport service providers.

Transport in general, and a major scheme project in particular, can influence the decisions of residents and firms in a number of ways. For example, residents and firms interact with each other through a number of markets, in particular:

- property;
- labour; and
- goods and services.

Through these interactions, changes in transport may have indirect impacts on people or businesses who have no direct interest in the transport change (or project) at all. It may therefore be necessary to consider not only predicting the primary land-use consequences of transport change, but also the extent to which the influence of transport is passed on as secondary effects. These may extend far beyond the spatial scope of the transport proposal itself - they can extend at least as far as the area in which the transport change affects accessibility, and possibly further.

Furthermore it is important to recognise that change, and therefore the impact of a transport project, can take many forms. Whilst some change, such as the demolition of one building and its replacement by another, are physical in nature and relatively easy to observe, other change that may be important to the evaluation of social or economic objectives may be more subtle. For example a great deal of locational change takes place through changing occupation of existing buildings, with changes in either density or the nature of the occupation (for example one type of business replacing another, or retired persons occupying housing previously occupied by families with children). Likewise changes in property value can be important. This may influence the nature of the property's occupation - if improvements in transport increase the demand for space in a particular location, the resulting

increases in rent may affect household or businesses, precipitating movement or change with no evident physical change to the property.

It follows from the above points that in many cases, changes in composition are likely to be more significant than changes in total. For example, changes in provision for commuter travel may have a significant impact on where the working population and its dependents live, but a much smaller impact on the distribution of the total population (as households without workers move into the areas that the workers are leaving). Similarly, significant land-use effects may occur within the market for existing property with no new development and no formal change of use, and which are therefore beyond the control of the planning system. Such change may be particularly important when considering issues associated with regeneration or social change.

For a fuller explanation and description of land-use models and LUTI models, please refer to:

- DfT Transport Analysis Guidance (WebTAG), Unit 2.4, section 1.3, The General Principles of Land-use Modelling; and
- DETR (March 2000), *Guidance on the Methodology for Multi-modal Studies*, Volume 2, Appendix B, HMSO.

Appendix D. Aspects of the Evaluation of Regeneration Impacts

D.1 Defining Regeneration

Scheme objectives often include reference to regeneration. This is implied within the Transport Analysis Guidance on Objectives and Problems.²⁶

The scheme appraisal should define the relevant regeneration and other land use planning objectives of the scheme and then the way in which these relate to the wider regeneration strategies of the local authority and/or other public-sector bodies.

D.2 Geographical Area for Impact

It is important to consider the change in levels of accessibility between various pairs of places that will result from the transport scheme. These may result from changes to the cost, speed, reliability, or availability of travel by different modes.

The range of pairs of places affected will determine the geographical impact of the regeneration effects. Large schemes may typically result in improvements to the economic performance of a whole urban area (for example the introduction of a conurbation-wide rapid passenger transit scheme).

Alternatively they may relate to a section of the urban area (for example the introduction of a tram line that improves accessibility for a particular group of suburbs or neighbourhoods).

Smaller schemes may have more localised benefits (e.g. in the immediate vicinity of a junction improvement, or the construction of a route that opens up under-developed land, as with the Black Country Spine Road or Poole Bridge).

For local authority schemes the places affected will generally be within the authority's own area or the areas of adjoining authorities, but on occasion the effects may be at greater distances. For example a scheme that focused on reducing local commuter traffic on the A14 between Cambridge and Huntingdon should benefit long-distance freight haulage between the Midlands/North/Scotland and the Haven Ports.

The benefits will always be a combination of these different geographical levels. If there is a need to prioritise, when it comes to measuring the regeneration effects, then this should be on the basis of the wider regeneration strategies' objectives within the area.

D.3 The Range of Impacts

Transport schemes improve accessibility and this of itself may bring some regeneration benefits. However the scheme may also have a range of wider regeneration-related impacts, typically falling into the following broad categories.

- *Changes in land use as a result of the transport scheme.* For example, new residential or employment related developments may come forward. An important dimension is the sensitivity of land-use changes to planning decisions. In areas of high demand, planning authorities can ensure that development patterns are linked to transport changes through the granting or otherwise of planning permissions. In these circumstances, development becomes a complementary part of the scheme, rather than a consequence to be evaluated.

²⁶ http://www.webtag.org.uk/webdocuments/2_Project_Manager/2_Objectives_and_Problems/index.htm; Section 1.3.19

- *Expansion of existing land uses.* Rents and/or prices may be affected by the transport development and resulting changes in accessibility. Take-up of floor space may similarly be affected, resulting in a change in vacancy levels.
- *Changes in activity.* The transport improvement may provide businesses with the confidence to invest within the area. This may lead to increased employment and perhaps increases in productivity. Within residential areas, transport improvements that increase the relative attractiveness of an area for a specific sector of residents (for example commuters) may lead to a change in the make-up of an area, with fewer non-economically active households and more economically active ones.
- *Environmental improvement.* The scheme may involve some enhancement to the environment that, of itself, improves local welfare.

Regeneration impacts are typically medium to long term, as illustrated in the following table.

| Regeneration Impact | Short Term | Medium Term | Long Term |
|--------------------------------|-------------------|--------------------|------------------|
| Accessibility changes | X | | |
| Land use | | X | X |
| Expansion of existing land use | | X | X |
| Changes to activity | | X | X |
| Environmental Improvement | X | X | |

D.4 Techniques for Measuring Regeneration Impacts

Regeneration measurement techniques and their applications are compared in Table D1.

A land use model is the most sophisticated instrument for estimating, and providing the most information on the regeneration counterfactual. This allows estimation of the counterfactual in relation to land use change, intensification (or otherwise) of land use, changes in activities, and changes in accessibility of a transport scheme. A dynamic model allows the impact of a scheme to be assessed over time.

**Table D.1
Regeneration Impacts and Measurement Techniques**

| Regeneration Impact | Integrated Land Use/ Transportation Model | Land Use Model | Bespoke surveys | Published data sources | Professional opinion |
|--------------------------------|--|-----------------------|------------------------|-------------------------------|-----------------------------|
| Accessibility changes | X | | X | | |
| Land use | X | X | | | X |
| - counterfactual | | | | | |
| - change | | | X | X | X |
| Expansion of existing land use | X | X | | | X |

| | | | | |
|---------------------------|---|---|---|---|
| - counterfactual | | | | |
| - actual | | | X | X |
| Changes to activity | X | X | | X |
| - counterfactual | | | | |
| - actual | | | X | X |
| Environmental improvement | | | X | |

Before and after bespoke surveys can record change to land use and activities, although they cannot separate the impact of a scheme from underlying local trends. Surveys that explore changes in accessibility may be informative, albeit not providing a full analysis, nor indeed describing every trip that might be affected.

Published data sources can provide information on the economic and social regeneration of an area. The Office of the Deputy Prime Minister publish a report *Data Provision for Neighbourhood Renewal: Final Report*. (<http://www.neighbourhood.gov.uk/publications.asp?did=1705>) that describes the main datasets.²⁷

As with bespoke surveys, where these data sources contain some form of time series, they can describe change over time, but cannot readily differentiate between the changes that result from the transport project and underlying trends.

Qualitative assessments of scheme impacts may be gathered from interviews with estate agents and other professionals involved with the development of land. This information is largely on individual's own judgement, based upon personal experience and their immediate dealings with clients within the area.

²⁷ There is often a delay before some of these data sources are made available. For example the Annual Business Inquiry, a key source of local employment data at the sub-district level, is normally released 18-24 months after the survey has been undertaken.