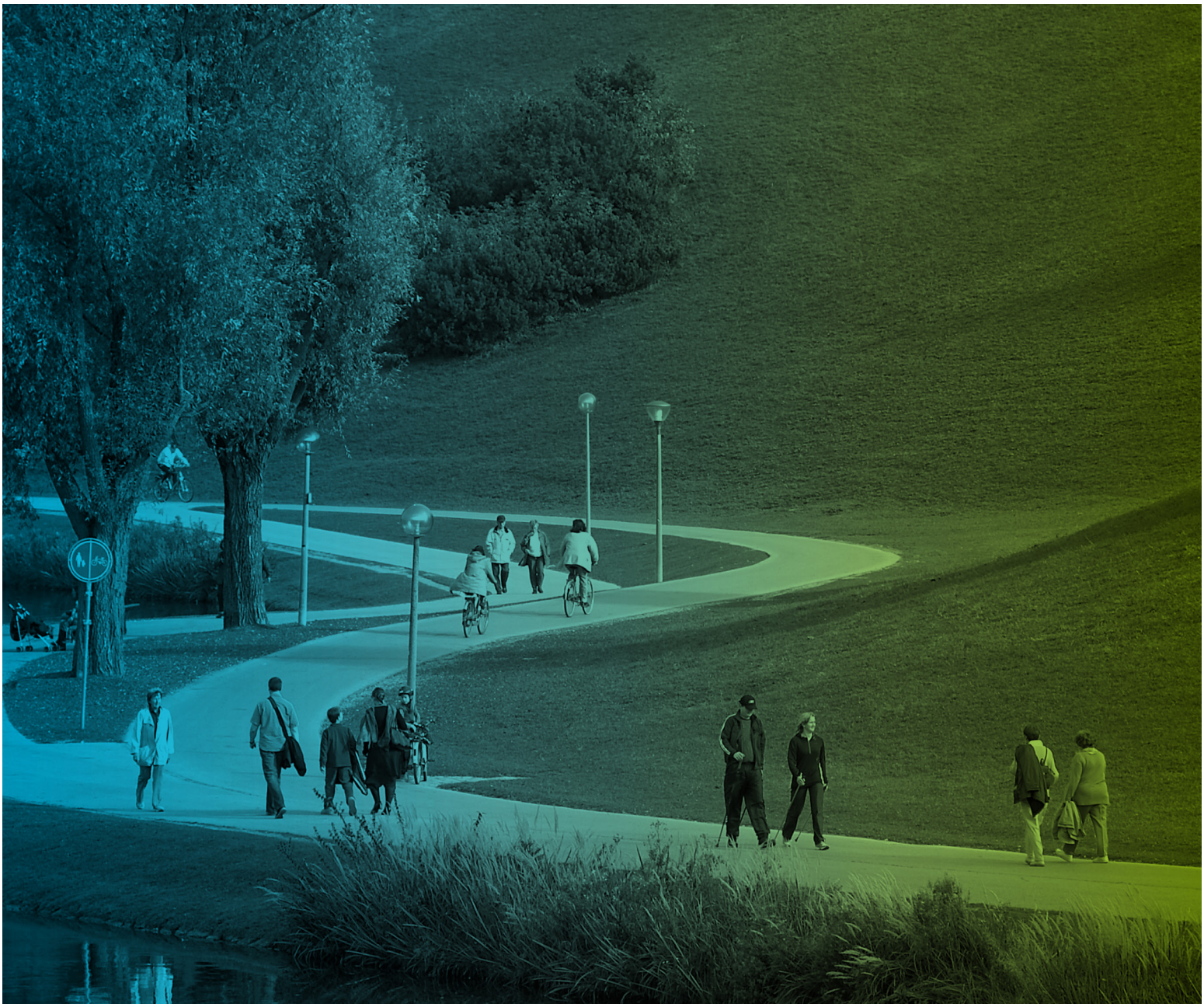
LSTF Monitoring and Evaluation Guidance - Final Report



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pteg

The Passenger Transport Executive Group brings together and promotes the interests of the six Passenger Transport Executives (PTEs) in England:

- Centro
- Metro
- South Yorkshire PTE
- Merseytravel
- Nexus
- Transport for Greater Manchester

Bristol and the West of England, Leicester City Council, Nottingham City Council, Strathclyde Partnership for Transport and Transport for London are associate members. ***pteg*** has two main tasks:

- Promoting efficiencies and the exchange of knowledge and good practice within the PTE network; and
- Raising awareness nationally about the key transport challenges which face the city regions, and the public transport solutions which PTEs are implementing.

To find out more about the work and priorities of ***pteg***, visit **www.pteg.net**

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Executive Summary

The Local Sustainable Transport Fund (LSTF) recognises the contribution of more sustainable forms of travel towards economic growth and carbon reduction. Over ninety projects have received LSTF funding, comprising a total investment of £600m by central and local government.

The Department for Transport (DfT) is committed to assessing the impacts of LSTF investment, first to identify the value for money achieved, and secondly to enhance our understanding of how to influence travel behaviour. The monitoring of projects and more detailed evaluation of selected case studies is therefore seen to be an integral part of programme design and delivery. The current economic conditions and constraints on available funding, alongside the often complex nature of LSTF projects, make such assessments a necessary but challenging prospect for many local authorities.

To support authorities in designing assessment plans the DfT has prepared an overarching monitoring and evaluation framework. This focuses on the selection of indicators for the two primary objectives of LSTF (economic growth and carbon reduction) as well as for the range of secondary objectives (eg. road safety). A central challenge facing all LSTF fund recipients will be the prioritisation of available funding on data collection and analysis activities. The DfT framework acknowledges the importance of ensuring that all assessment activities remain proportionate to the level of investment in local projects.

Building on the work of the DfT, the Passenger Transport Executive Group (pteg) commissioned AECOM in July 2012 to prepare additional guidance for Passenger Transport Executives (PTEs) and other Local Transport Authorities (LTAs) to provide a practice approach to developing cost-effective and affordable monitoring and evaluation programmes. This document has been focused deliberately towards the detailed practicalities and challenges of assessing LSTF projects. The guidance takes the reader through the decision making steps from agreeing the overall purpose and scope of monitoring, the collection of robust baseline data through to selecting appropriate methodologies for monitoring economic change.

In preparing this guidance we have recognised that all LSTF project authorities will be starting from a different position and will possess varied expertise and experience in monitoring and evaluating complex transportation programmes. The guidance therefore concentrates on many of the common pitfalls of data collection and analysis, such as poor design, the over-scoping of monitoring requirements and the lack of a robust baseline position.

Although we have sought to make this document as comprehensive and standalone as possible, the reader is, in some cases, referred to more detailed guidance already available elsewhere. Where alternative approaches and methodologies are available these are explained, with the benefits and risks of each presented, so that practitioners can select the most relevant for their local context whilst being fully aware of the limitations of the chosen methodology. Case studies have also been incorporated to provide further evidence and explanation of good practice, particularly in some of the more complex and challenging areas of monitoring and evaluation.

We hope that PTEs and LTAs and local authorities find this document of genuine value in developing the evidence base on the impact and effectiveness of sustainable transport schemes.

01
Introduction

1.1 Introduction

The Government announced, as part of the Local Transport White Paper in 2011, the creation of a Local Sustainable Transport Fund (LSTF) to help build strong local economies and address the challenges of climate change. The objectives of LSTF reflected the Government's core objectives of supporting economic growth by improving the movement of goods and people, and meeting its commitment to reducing greenhouse gas emissions. Secondary objectives included improvements in the physical activity and health of local communities, enhancing accessibility to training, employment and services, the continued improvement in road user safety and promoting greater social wellbeing.

In June 2012 the Department for Transport (DfT) announced the award of over £200m of funding to twelve Large Projects, through the LSTF. This was in addition to the award of LSTF funding of up to £5m each to over 70 other local authority areas in England for the promotion of sustainable transport modes and behaviours. The DfT confirmed in 2012 that local monitoring and evaluation of investment outcomes and impacts should be incorporated into delivery programmes. The need for robust and comprehensive monitoring and evaluation of LSTF investment is particularly relevant during the present period of austerity, in order to provide evidence of the efficiency and effectiveness of the programme.

1.2 Purpose of the Guide

This document has been developed to provide accessible best practice guidance on practical techniques and methodologies, which PTEs and LTAs can use to deliver robust and cost effective monitoring and evaluation of LSTF schemes. This information could also be used more broadly as a framework for assessing the impact of other local transport schemes.

Undertaking the robust monitoring and evaluation of LSTF investment, to determine the extent to which stated objectives and anticipated outcomes have been achieved, can be extremely valuable. If appropriately designed and targeted such activities can provide evidence on the success and value for money of investment, as well as providing knowledge to enhance the design and delivery of future programmes. However, a number of very different monitoring and evaluation techniques are available, incorporating a diverse range of datasets and indicators, making this a complex area for local authorities. This guidance has been prepared to support authorities in navigating through an evidenced decision-making process to generate relevant and affordable monitoring and evaluation frameworks.

In developing monitoring and evaluation approaches practitioners must recognise the necessary trade-off between the resources applied and the likely level of robustness achieved. In particular, if an assessment is based on monitoring key outcomes, the limitations of using such data to address wider more complex questions, such as the causes of observed change, should be recognised. The scope of this guidance document is largely constrained to outcome monitoring and evaluation with no guidance presented on undertaking process evaluations.

1.3 How to Use the Guide

This guide can be used in a number of ways, for example:

- As a step-by-step approach to developing robust monitoring and evaluation frameworks;
- As a guide to individual techniques to support established monitoring and evaluation activities;
- As an aide-memoire on specific elements of monitoring and evaluation; and
- As an introduction to specific areas of assessment and a starting point to learn more about monitoring and evaluation methodologies and approaches.

The document therefore represents a collated presentation of industry expertise, examples of good practice and lessons learnt from previous evaluations. The information contained here remains guidance, providing the building blocks and background information to support PTEs and LTAs in developing and delivering robust and sustainable monitoring and evaluation programmes. As such, the document does not seek to provide answers to all potential LSTF related questions, but has been designed to support practitioners in working to determine such answers. The involvement of local and national stakeholders is also highlighted where this can support the development and agreement of methodologies to be adopted.

The guidance has been prepared to be as self-contained and comprehensive as possible, therefore

providing an overview of particular methods or options, whilst providing more detailed information on selected activities of particular relevance to LSTF Large Projects. This approach has been adopted to ensure that the document remains accessible to the intended audience whilst being as detailed as possible. Signposting and links to other guidance documents and evaluation reports are provided to support the main text, and to provide practitioners with the widest possible evidence base from which to work. The use of case studies and exemplar evaluation outputs also provides good practice evidence for practitioners to review when designing their bespoke monitoring and evaluation programmes.

1.4 Structure of the Guide

The guidance consists of six sections, inclusive of this introduction, designed to support PTEs and LTAs through the key challenges of monitoring and evaluating LSTF Large Projects. Checklists are included at the end of each section to provide a reminder to the reader of the key activities to be undertaken. Table 1.1 presents a summary of the guidance structure and the monitoring and evaluation issues addressed. Figures 1.1 – 1.3 provide step-by-step decision-making processes for PTE practitioners to follow in designing overarching monitoring and evaluation strategies (Figure 1.1), Monitoring Plans (Figure 1.2) and more detailed Monitoring and Evaluation Programmes (Figure 1.3).

Table 1.1: Overview of Guidance Structure

Chapter	Sections	Monitoring and Evaluation Steps
2. Principles of Monitoring and Evaluation	Purpose of monitoring and evaluation	- Define principles of assessment - Defining monitoring and evaluation - Placement within the Green Book ROAMEF cycle
	Framework development	- Identify Interventions, packages and causal logic - Define research questions to be addressed - Identify data requirements - Agree overarching monitoring/evaluation approach
3. Building Blocks to Monitoring and Evaluation	Inputs	- Identify resource commitments - Quantify revenue and capital investment
	Outputs	- Report delivery programmes - Implement intervention diaries
	Outcomes/Impacts	- Identify relevant metrics - Collect robust data - Asses effectiveness and value for money
4. Economic Impacts	Direct economic impacts Decongestion impacts Wider economic impacts	- Define scope and scale of monitoring and/or evaluation - Identify research questions - Select relevant metrics - Confirm monitoring/evaluation design - Identify risks and mitigation
5. Carbon Impacts	Direct measurement Modelling and estimation	
6. Secondary Impacts	Health and physical activity Safety Accessibility Social wellbeing	

1.4.1 Designing Monitoring and Evaluation Strategies

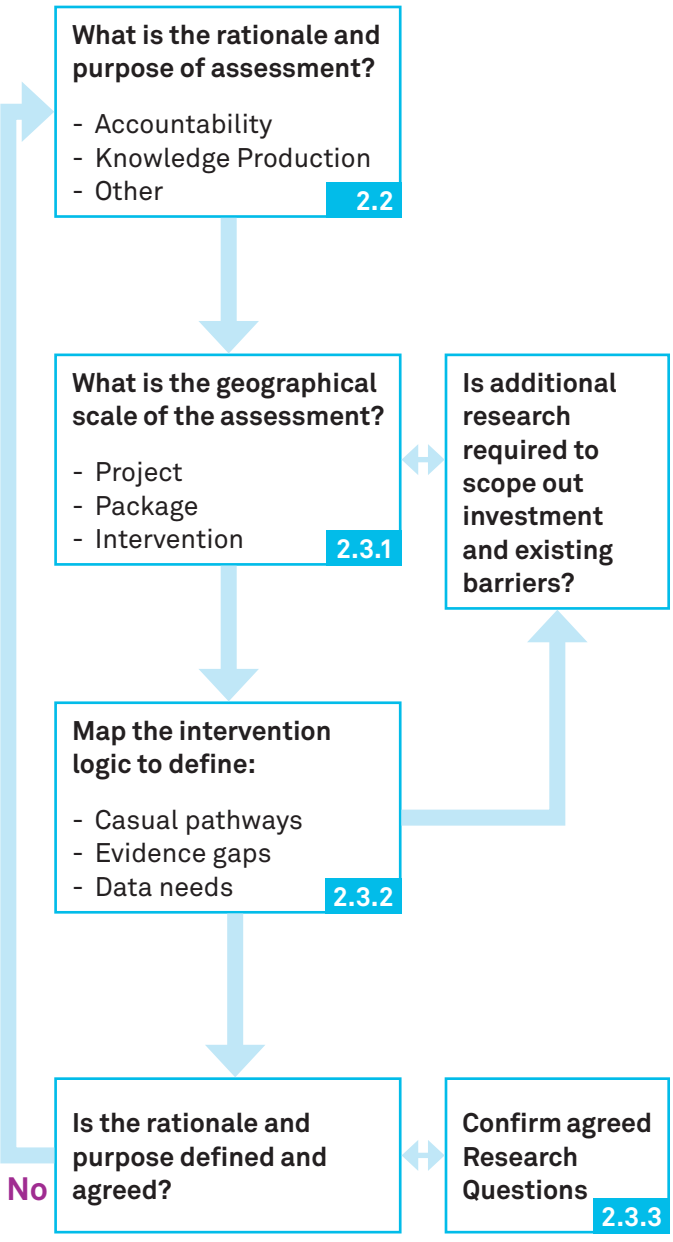
Figure 1.1 opposite summarises the initial steps of selecting an appropriate monitoring and evaluation approach for LSTF, to ensure that data collection and analysis activities are targeted effectively at addressing the key local requirements.

Section Two of this guidance document provides practitioners with information on the issues that should be considered at each step, the different approaches that could be used and highlights techniques that can support local delivery teams and stakeholders in making key decisions.

This begins with the consideration of the purpose of monitoring and evaluating LSTF Projects (Section 2.2) and the geographical scale at which such assessments should be undertaken (Section 2.3.1). The use of logic mapping is recommended in Section 2.3.2, as a means of identifying the key steps to achieving desired outcomes and also any gaps in local knowledge. Additional research and investigation, such as focus groups with target populations or audits of existing service provision, may be required to scope monitoring requirements fully at this stage.

The information collected should be used to review the scope and focus of proposed monitoring and evaluation, and thereby confirm the research questions to be answered (Section 2.3.3). The section concludes with a summary of the three strategic approaches considered to be appropriate for LSTF assessment, with information on the benefits and limitations each could generate.

Figure 1.1: Designing Monitoring and Evaluation Strategies[1]



[1] The relevant guidance section has been identified to aid the reader in navigating through the document

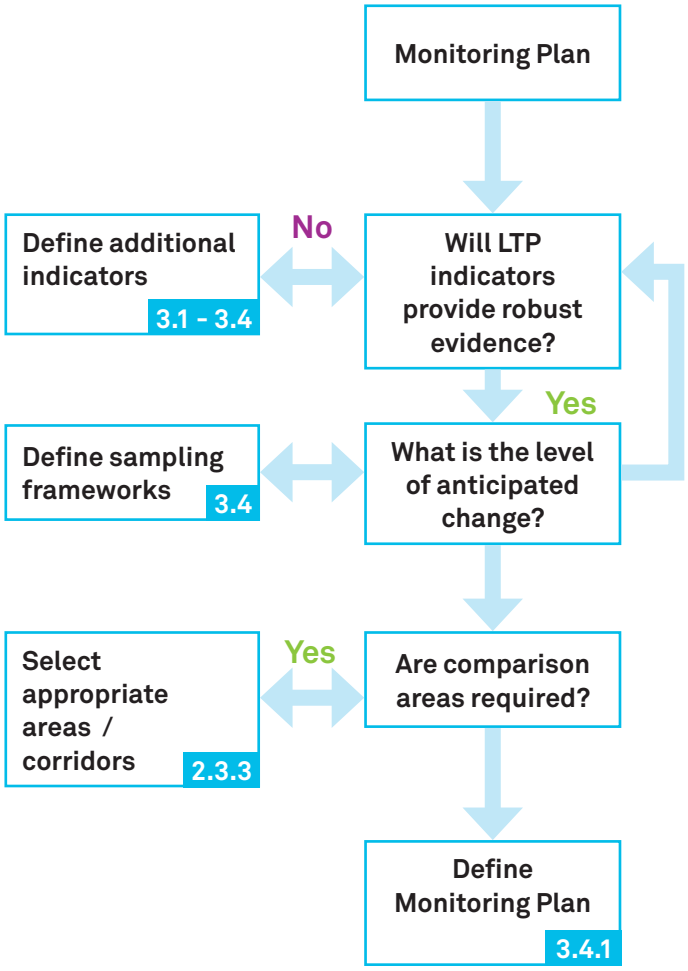
1.4.2 Developing Monitoring Plans

A central decision to be taken by all LSTF authorities is the extent to which existing Local Transport Plan (LTP) monitoring activities will be sufficient to meet the defined requirements of LSTF assessment. Figure 1.2 opposite highlights the decision making stages of developing a basic Monitoring Plan for LSTF Large Projects, building on the foundation of existing data collection and highlighting the key design considerations.

It is important to recognise that LTP datasets (and indicators) may not provide the coverage and quality of data necessary to assess the outcomes of LSTF Large Projects. Sections 3.1 to 3.4 provide support to authorities in defining the detailed data requirements and considering the need for additional investment in data collection.

One such consideration is the level of change in selected indicators anticipated during the course of the three year LSTF programme, and the monitoring data required to detect a significant change; an emphasis is commonly placed on identifying a statistically significant change in indicators at defined confidence levels, such that the change can be attributed to an intervention or policy and not concluded to be a consequence of background contextual factors. For example, the anticipated level of change in cycling levels may be relatively small (~2-3%) thereby requiring a large data sample. Section 3.4 provides evidence to support authorities in determining first, the level of change, and secondly whether the data needed to demonstrate a statistically significant change is within the monitoring budget and resources available. The use of comparison areas or corridors through which to consider the level of change generated by LSTF investment and that created by contextual factors, is also presented (Section 2.3.3) to aid the design of robust Monitoring Plans.

Figure 1.2: Developing Monitoring Plans



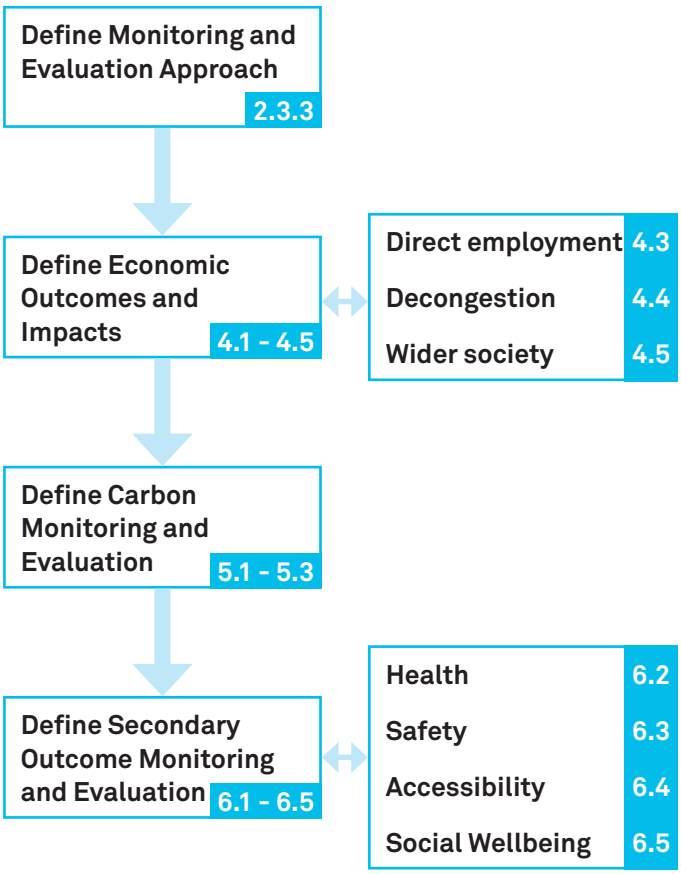
1.4.3 Developing Complex Monitoring and Evaluation Programmes

The Department for Transport has indicated that all LSTF Large Projects, as well as some selected smaller projects, will be required to undertake a more detailed evaluation of case studies. Although at the time of preparing this guidance document the precise definition of case studies and thereby likely scope of evaluations had not been confirmed, Chapters Four to Six provide authorities with options for monitoring and/or evaluating the primary and secondary objectives of the LSTF programme.

Figure 1.3 opposite highlights the structure and content of these Chapters. Sections 4.1 to 4.5 summarise the range of economic outcomes and impacts likely to result from LSTF investment, and identifies the different datasets that could be used to assess changes through time. This includes the monitoring of direct employment benefits (Section 4.3), the monitoring of the decongestion impacts on selected network areas (Section 4.4) and the monitoring and evaluation of wider economic impacts (Section 4.5). Authorities should use these sections, in association with the principles of assessment outlined in Chapter Two, to select datasets and assessment approaches most relevant to their local LSTF project and defined policy priorities. Case studies are provided to demonstrate the potential benefit and limitations of each approach to support practitioners in making informed decisions.

Sections 5.1 to 5.3 provide guidance on how to monitor the carbon impacts of LSTF, highlighting the use of existing modelling platforms and the DfTs Basic Carbon Tool, and Sections 6.1 to 6.5 present guidance on the monitoring and evaluation options for the defined secondary objectives.

Figure 1.3: Developing Complex Monitoring and Evaluation Programmes



02

Principles of Monitoring and Evaluation

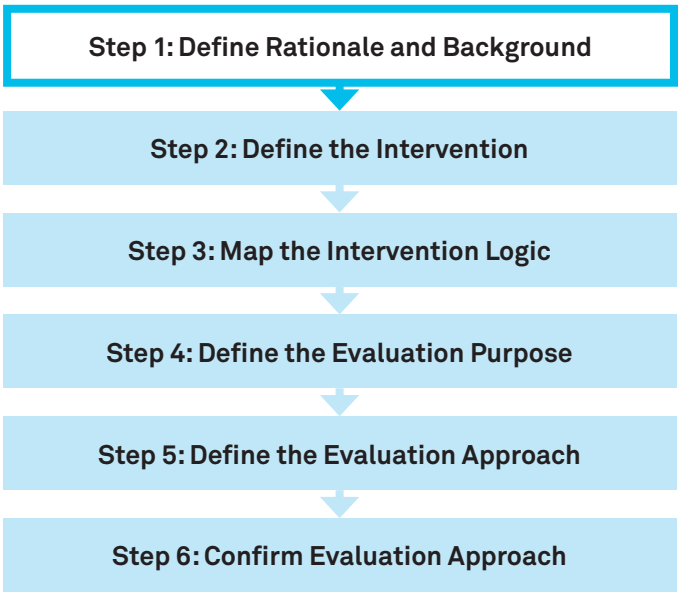
2.1 Introduction

This section presents guidance to support PTEs and LTAs in developing robust and deliverable monitoring and evaluation frameworks, an activity that will underpin all subsequent Large Project and Key Component assessments. Before consideration can be given to detailed metrics and datasets it is necessary to establish the overarching rationale for monitoring and evaluation, through which to select an appropriate evaluation approach. The majority of LSTF Large Project funding recipients used the *DfTs Guidance for Transport Impact Evaluations*[2] in establishing proposed monitoring specifications within their business case documents. The six step approach adopted therein continues to represent industry good practice and has therefore been used to structure this section, split into two sub-sections: first, considering the purpose and role of monitoring; and secondly to develop a monitoring and evaluation framework that is robust and fit-for-purpose.

2.2 Confirming the Purpose and Role of Monitoring and Evaluation

The historic focus of transport practitioner and investors has been on the detailed appraisal and ex-ante assessment of options, with lower levels of investment being expended on ex-post evaluations. However, a growing emphasis has been placed on the assessment of outturn effects, particularly relating to large-scale behaviour change programmes[3].

The importance to central Government of undertaking robust monitoring and evaluation of transport investment is demonstrated clearly by the recent updates of the Green[4] and Magenta Books[5]. The Green Book presents the recommended framework for the appraisal and evaluation of policies, programmes and schemes, commonly referred to as the ROAMEF cycle (Figure 2.1). This sets out the key stages that should be followed in the development of a proposal, from the articulation of the rationale for investment, through the setting of objectives, and the consideration of option appraisal, implementation and evaluation.



It is also important in the early planning stages to remember the distinction between monitoring and evaluation as defined by the DfT[6] when establishing Large Project frameworks:

Monitoring seeks to check progress against planned targets and can be defined as the formal reporting and evidencing that spend and outputs are successfully delivered, milestones met and changes in outcomes tracked over time. Monitoring data plays a key part in evaluation by providing valuable evidence throughout the lifetime of the initiative.

Evaluation is the assessment of the effectiveness and efficiency of the initiative during and after implementation. It seeks to measure and attribute outcomes and impacts generated by the initiative in order to assess whether the anticipated benefits have been realised and whether any unanticipated impacts have occurred.

[2] Choosing an Evaluation Approach to Achieve Better Attribution: Guidance for Transport Impact Evaluations, Tavistock Institute in consultation with AECOM, DfT 2009.

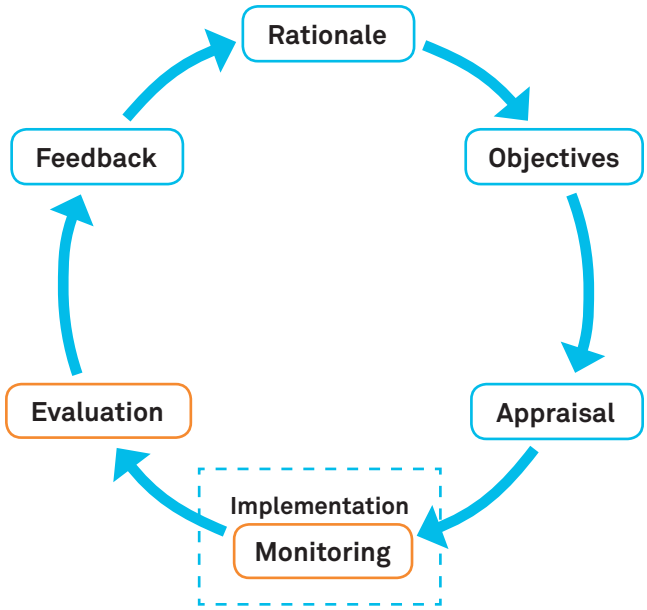
[3] Examples include the Sustainable Travel Towns and Cycle Demonstration Towns.

[4] The Green Book: Appraisal and Evaluation in Central Government, HM Treasury, 2011.

[5] The Magenta Book: Guidance for Evaluation, HM Treasury, 2011.

[6] LSTF Monitoring and Evaluation Workshop, May 2012.

Figure 2.1: ROAMEF Policy Cycle



Given the increased focus on ex-post monitoring and evaluation, and the range of alternative methodologies and approaches that could be adopted, an important first step will be for PTEs and LTAs to articulate clearly the rationale and purpose of such activities. This will assist in ensuring that data is collected in an appropriate and cost-effective manner, and is fit for its intended purpose. The objectives of the individual LSTF Large Projects and local context will also define the purpose and scope of required monitoring and evaluation activities. Key questions that should be asked to assist in the design process include:

- Why are we monitoring LSTF investment?
- What purpose is the information to be used for and who is the intended audience?
- Over what time period are we intending to collect data?
- What resources and skills do we have available?

To assist PTEs and LTAs in identifying the purpose of monitoring and evaluating Large Projects, and to support consultations with local stakeholders, Table 2.1 presents a summary of the potential benefits of monitoring and evaluation, compiled from previous evaluations and guidance. The previous evaluations referenced are:

1. Sustainable Travel Towns: Research Report (DfT);
2. Local Road Safety Evaluation: Summary Report (DfT);
3. Evaluation of the Urban Congestion Programme: Final Report (DfT); and
4. Walking Segmentation Study (TfL).

Consultation with the DfT, ***pteg*** and the PTEs and LTAs during the preparation of this guidance identified that accountability and knowledge production were of central interest and importance for LSTF Large Project assessment. These two areas are considered in slightly more detail below. However, this is not to preclude individual authorities adopting elements of monitoring and evaluation that contribute to other areas of future project planning, delivery or internal organisational capacity building.

A useful way for practitioners to articulate the end purpose of monitoring and evaluation is to generate research questions. As defined in the Better Use Evaluation Framework[7], evaluation questions are an effective method of bringing together strategic objectives, investment priorities and the scope of investment measures into plain language questions. The purpose of the monitoring and evaluation will be to provide answers to these questions, thereby providing the evidence to demonstrate the impacts of the LSTF Projects.

[7] Evaluation of Better Use Interventions, Evaluation Framework Report, DfT, October 2009

Table 2.1: Benefits of Monitoring and Evaluating LSTF Projects

Benefits	Potential Outputs	Examples from Previous Evaluations
Strategic Planning and Policy Development	- Identify what works, for whom and why - Determine the contribution of LSTF to economic and carbon benefits - Calculate the relevant value/benefits of revenue and capital funding - Isolate the local impacts of LSTF - Consider the negative/unanticipated impacts of LSTF - Determine the longevity of LSTF impacts	- The DfT has used the evaluation findings from the Sustainable Travel Towns to promote the targeting of LSTF on schools and workplaces as key points to achieve behaviour change(1). - The ROAMEF cycle was noted as being a robust framework for guiding the design of impact evaluations(3).
Promoting Efficient Implementation	- Identify the most effective and efficient (cost effective) designs for targeting sustainable transport behaviour - Calculate the outturn value for money of LSTF schemes and Projects - Consider which delivery processes were most effective/efficient where and why	- The assessment of partnership working, contribution and efficient savings supported the review of stakeholder involvement and delivery procedures for Local Highway Authorities(2).
Building Institutional Strength and Capacity	- Identify the benefits of LSTF for local businesses (economic savings, reduced absenteeism etc) - Identify the knowledge and skills gaps that could be filled through LSTF good practice - Enhance the local expertise in monitoring and evaluation approaches	- The **evaluation design and delivering expertise** of local authorities varies, resulting in non-robust assessment being adopted(2). The early identification of skills gaps supported the commissioning of external support in the design and planning stages, thereby ensuring robust evaluations from year one. - The use of **intervention diaries** was found to be an effective method of monitoring delivery and contextual changes within large scale programmes(1).
Accountability	- Determine whether outturn impacts were as forecast in ex-ante appraisals - Identify the level of change in key metrics through detailed monitoring	- Locating cycle and pedestrian counts in appropriate and sufficient locations essential to monitor outturn change robustly(1). - Target groups can be identified using MOSAIC data, allowing monitoring of outturn behaviour among different population groups(4).
Knowledge Production	- Understand the impacts of LSTF on secondary objectives (social, health, air quality, tourism etc) - Understanding what works, why and where in terms of changing travel behaviour - Generate evidence to enhance future appraisal procedures	- The use of **first and second order outcomes** (changes in attitudes and awareness) can be effective in monitoring longer term behaviour changes(2). - The **locations of cycle counters** need to ensure sufficient coverage to monitor change across all potential routes(1).

Accountability

The focus of a monitoring or evaluation programme targeted at demonstrating accountability is twofold: first, whether the outturn outcomes were as previously forecast i.e. did the intervention achieve what was expected; and secondly, what was the value for money that resulted from the investment. The consideration of accountability therefore focuses on the level and direction of change in defined metrics, and less on issues of attribution (mechanisms through which change occurred). The decision to focus on demonstrating accountability reflects a more traditional performance monitoring approach and data collected generally provides limited opportunities for in-depth interpretation and evaluation. The types of research question that would be relevant to monitoring for accountability for LSTF would include:

- What is the overall change in travel behaviour:
  - By mode of travel;
  - By travel purpose, particularly journeys to school and workplaces
- To what extent was the level of change in line with expectations?
- What level of change has occurred in peak period traffic/congestion in the vicinity of particular sites and why?
- How have traffic flow characteristics changed and why?
- To what extent did carbon emission reductions vary by time of day/week?

Knowledge Production

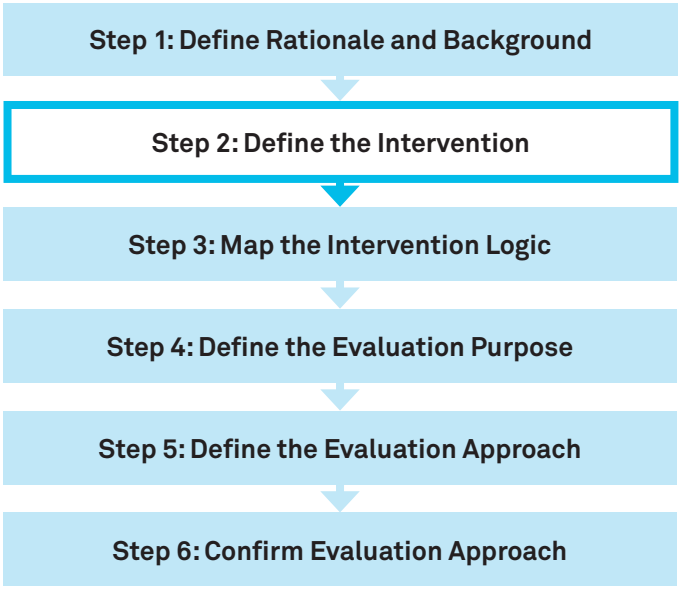
Monitoring and evaluation evidence can be used to enhance the design, delivery and prioritisation of future programmes and schemes, through expanding local and national expertise and knowledge. Assessment programmes can also be used to enhance appraisal activities through researching outturn changes in specific behaviours or metrics. The knowledge of transport planners and practitioners can be enhanced where such research questions include:

- Which interventions work i.e. achieved their stated objectives?
- How, why and to what extent do LSTF Large Projects contribute to the wider impacts and objectives (e.g. congestion, carbon emissions, safety and accessibility)?
- How and why does the level of observed change vary by journey purpose, frequency and distance?
- What are the underlying reasons why particular interventions worked:
  - Which interventions have greatest behaviour change impacts, in terms of cycling, travel choices and overall physical activity, and why?
  - What are the key drivers, critical factors and barriers to achieving behaviour change for different sub-groups, and why?
- How and why does the level of observed change vary across different subgroups of the population?
- Which interventions had the greatest effect on carbon emissions and why?

2.3 Developing a Monitoring and Evaluation Framework

It is industry good practice to develop a monitoring and evaluation framework for the assessment of large scale investment programmes, setting out the precise scope and approach to be adopted. Indeed, it is an implied requirement of the DfT that a monitoring plan be prepared for each LSTF Large Project. PTEs and LTAs should therefore define the scope of monitoring programmes and the coverage of more detailed evaluation (case study) activities. However, it is the purpose of this document to present practical advice and examples to support LSTF authorities in applying existing guidance[8] in the development of robust monitoring and evaluation frameworks.

2.3.1 Define the Intervention



All LSTF Large Project teams should articulate clearly the nature of their investment (i.e. the schemes to be delivered) and determine the extent to which the proposed monitoring and evaluation needs to support analysis at different geographical levels (project, package and intervention).

The level of monitoring and evaluation investment at the **Large Project level** should be considered carefully, particularly the financial and resource implications. Comprehensive project-level monitoring should be feasible within LSTF budgets, but undertaking a robust evaluation at this scale is considered by the authors to be outside the budget and scope of the LSTF programme. The potential risks of adopting a project-level approach include the failure to collect the depth of data necessary to address defined research questions or identify significant levels of change in key indicators. It is therefore recommended that project-level monitoring should focus on addressing accountability based research questions. As such, project-level monitoring should build on the LTP3 monitoring programmes, and seek to enhance the level and coverage of data collected as necessary.

The assessment of **packages of interventions**, such as those targeting a specific business park, a corridor of investment or a specific community, could either be monitored or incorporated within case study evaluations. The DfT has outlined the requirement for Large Projects to identify case studies and to develop robust and deliverable evaluation methodologies. However, the evaluation of packages of measures introduces a number of methodological challenges which, if unchecked, could introduce risks and potentially excessive costs. As defined in the Better Use Evaluation Guidance[9] it will be important for PTEs and LTAs to clarify whether the key purpose of the evaluation is to:

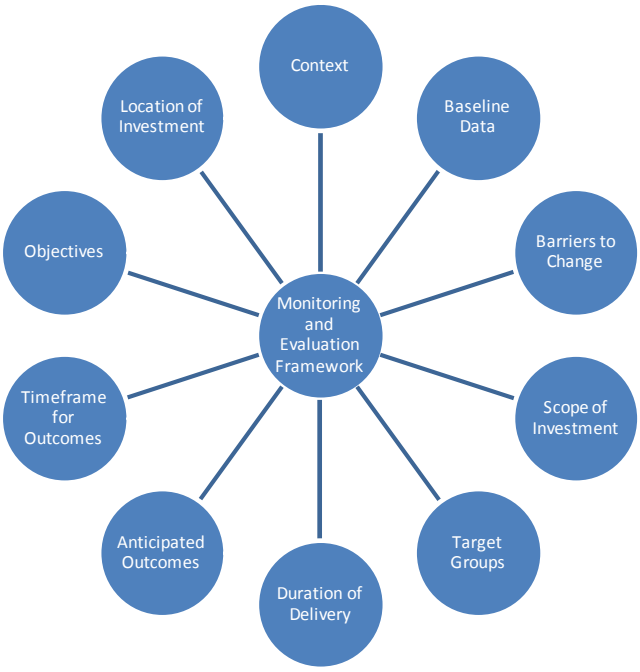
- Assess the impact of the **package as a whole** (whether it achieved its objectives; how well it was planned and delivered; whether it represented value for money etc.). This would focus on the accountability based research questions, seeking to assess the overall level of change in a given location;
- Assess the contribution of **individual interventions** to the package as a whole (for example, what impact do cycle interventions have on reducing local congestion in the peak period at selected business parks). The data requirement for such an assessment would be more detailed, and require an understanding of the reasons for observed behaviour change, perhaps through stakeholder interviews; and

[8] See previous footnotes for existing guidance documents

[9] Evaluation of Better Use Interventions – Framework Report (Section 4.2.3, p42.), 2009.

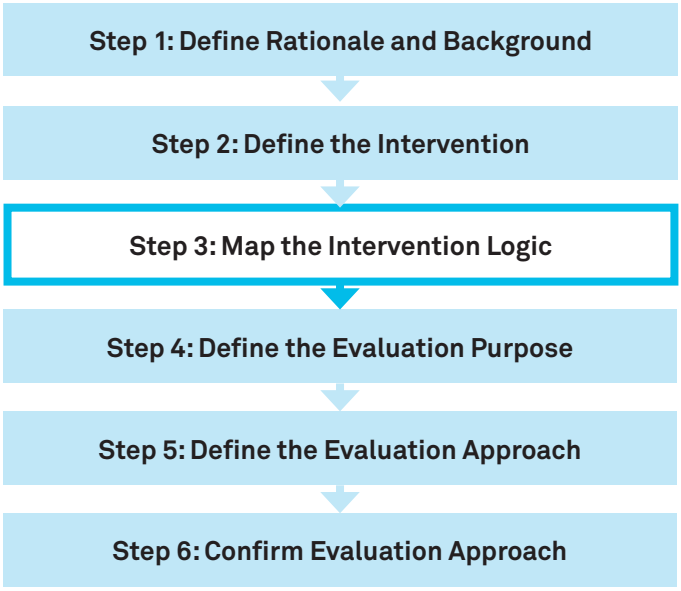
- Provide evidence to enable the assessment of **which individual interventions should be incorporated** into packages (for example, what evidence is there that residential based Personalised Travel Planning or travel information is an essential element of an LSTF Large Project). Bridging both the planning and knowledge based areas of evaluation rationale such an assessment would require extensive data collection across a range of interventions, locations and target groups.

Guidance and good practice highlights that a different evaluation methodology and approach would be required to assess each of the above package options, with the inclusion of multiple approaches potentially increasing the costs and risks.



Whether monitoring and evaluation is at the project, package or indeed **individual intervention** level there are a number of key characteristics that need to be considered during the design of the framework, as illustrated in the schematic opposite. Depending on the purpose of the monitoring and evaluation (accountability for example) PTEs and LTAs may adopt a combination of Large Project level monitoring and selected case study evaluations. Alternatively, packages of measures at the corridor or area level may be selected for enhanced monitoring, as existing data collection is not considered sufficient to identify significant change eg. the level of anticipated change in selected indicators may be smaller than the background variation in data. Whichever approach is adopted should be supported by a clearly articulated monitoring and evaluation framework and programme.

2.3.2 Map the Intervention Logic



The use of logic mapping to establish the casual links between interventions and anticipated or targeted outcomes is now well established in the field of monitoring and evaluation. Mapping the intervention logic is defined in the DfTs guidance for impact evaluation design[10], as:

'a method of systematically linking key components of an intervention so as to produce a causal pathway across the:

- *Context (the LSTF programme);*
- *Inputs (i.e. what is being invested in terms of resources);*
- *Outputs (e.g. target groups reached, cycle training delivered);*
- *Outcomes (i.e. short and medium-term results, such as changes in traffic flow levels and modal shifts); and*
- *Impacts (i.e. long-term results such as economic growth, improved health, environmental benefits).'*

Such an approach will assist Large Project delivery teams in defining the interrelationships between interventions, particularly those delivered as a package. Logic mapping can therefore assist in prioritising policy objectives and defining the desired scope and focus of monitoring and evaluation activities. Appendix A includes a number of exemplar logic maps from recent transportation evaluations, including some prepared as part of LSTF business case preparation[11]. Figures A1 – 3 relate to an LSTF investment package at a business park, including sub-models for reviewing the inputs (Figure A2) and outcomes (Figure A3). Logic mapping should also be used to identify the monitoring and evaluation requirements of Large Projects, and given the complexity of LSTF investment this can support the prioritisation of data collection through the use of sub-models. This approach is demonstrated in the example in Figure 2.2, which is for the assessment of the impacts of public transport investment at a business park, where each link in the casual chain represents a potential dataset (shown in blue).

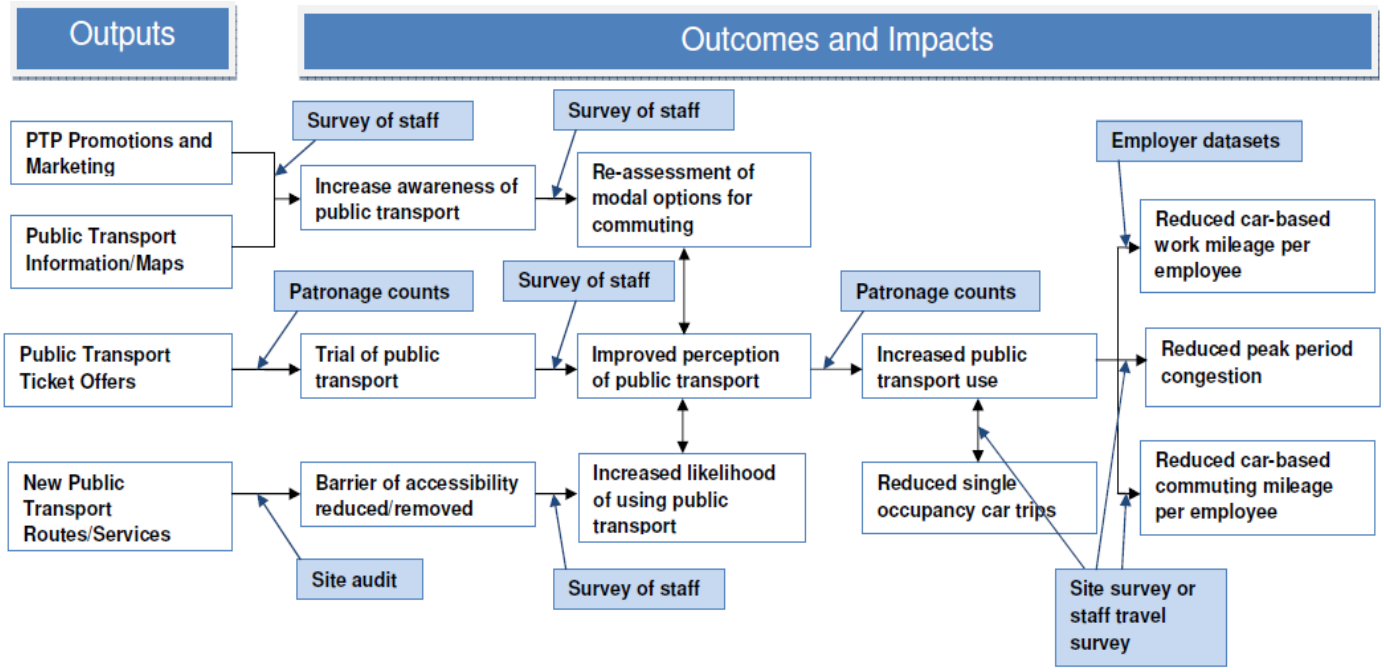
In this example it could be concluded that the data collection would consist of: a staff survey; site audit, ex-post survey of traffic; and the collation of public transport patronage from operating companies. However, the following factors need to be considered:

- Baseline data would be required for each dataset;
- The staff surveys would need to be repeated at least twice to identify changes in employee attitudes and awareness, thereby increasing costs. If a panel of employee respondents was recruited in the baseline survey this would also add necessary complexity to subsequent sampling and analysis; and
- The purpose of the monitoring and evaluation should be defined. If accountability is the priority then baseline and ex-post employer travel expenditure and peak period modal share/congestion data may be sufficient to demonstrate outturn impacts. This could be supported by the collation of secondary data from public transport operators to permit an element of contribution analysis to be undertaken. Only if detailed knowledge production and attribution are required would the majority of other datasets be relevant, to permit the impacts of individual interventions to be isolated within the overall package.

[10] See footnote 1

[11] These logic maps have been re-produced with the permission of the Tyne and Wear Integrated Transport Authority.

Figure 2.2: Example Logic Sub-model Demonstrating Dataset Identification



Logic mapping should also be used within the LSTF Large Project planning to check and review the expected outcomes for particular target groups, for example through the development of a logic map for programmes to enable unemployed sub-groups to access training and employment. This will assist delivery teams in isolating areas of particular interest, for example the impact of cycling initiatives, and associated data requirements. In developing and updating logic maps it is important to involve and consult with local stakeholders to provide a means of testing and understanding assumptions, hypotheses and outcomes. Other benefits of using intervention logic mapping are outlined in Box 2.1.

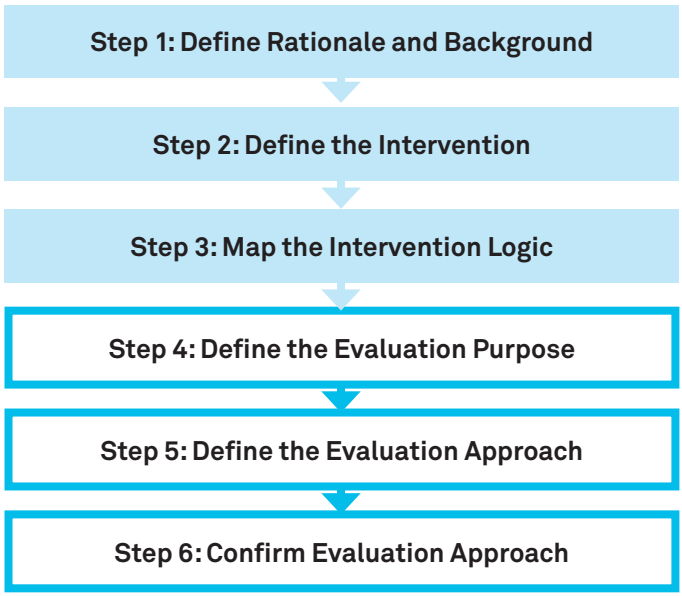
Box 2.1: Benefits of Adopting Intervention Logic Mapping

a) **Identify knowledge gaps** – will only be relevant for LSTF Large Projects to support PTEs and LTAs and others in delivering more effective interventions. However, undertaking detailed evaluation merely to fill evidence gaps or complete academic research would not represent value for money within the LSTF programme.

b) **Determine the 'distance to travel' to achieve targeted outcomes** – will assist LSTF delivery teams in managing stakeholder expectations. The monitoring of first and second order attitudinal changes may be required before behaviour change can be determined and attributed.

c) **Identify uncertainty or unintended outcomes** – will support Large Projects in designing monitoring programmes that are comprehensive and robust.

2.3.3 Designing the Monitoring and Evaluation Approach



The fourth, fifth and sixth steps in the guidance for impact evaluation focuses on the selection of an appropriate monitoring and evaluation design. These steps are combined herein to highlight the strengths and weaknesses of the three approaches considered relevant for adoption in LSTF Large Project assessment[12]:

- Outcome monitoring;
- Experimental or quasi-experimental monitoring; and
- Theoretical evaluations.

Examples are provided to demonstrate some of the main challenges and to assist Large Project delivery teams in selecting appropriate monitoring and evaluation approaches for their local contexts. Within each sub-section the extent to which each design meets the following key requirements for LSTF is identified:

- Does the scope of interventions support the approach?
- What are the limitations of the approach?
- Will the timescales for outcomes be within the project period?
- Will the nature of outcomes be within scope of the approach?

[12] The selection of these three approaches has been based on the review of stated evaluation priorities for LSTF stakeholders, namely accountability and knowledge production.

Outcomes Approaches

The outcome approach focuses on the monitoring of changes in indicators between the baseline and ex-post periods and is highly appropriate where the purpose of the assessment is to demonstrate accountability. This approach has been adopted by many authorities in monitoring LTP delivery and outcomes, and therefore suitable monitoring data is already available in many LSTF areas. However, a central risk is that the level of change in key indicators may be very small compared to the background variability, resulting in an inability to identify significant changes during the LSTF programme using existing monitoring data. The coverage, scope and quality of existing datasets should therefore be reviewed alongside the level of change anticipated for key indicators during the LSTF period, to determine the need for and extent of additional data collection. In principle, this approach therefore has a strong fit with the LSTF Large Projects and a critical decision will be whether to monitor outcomes at the Large Project, corridor/area or intervention levels.

Benefits for LSTF

The focus of this approach is on identifying the direction and magnitude of change, whilst using logic mapping and professional expertise (stakeholders) to consider the contribution of LSTF interventions, underlying causes of change and alternative explanations. This approach should be built around existing LTP monitoring datasets, generating a methodology that would be proportionate with LSTF investment and sustainable in terms of available resources. A good example of this approach is the analysis of the Sustainable Travel Towns data to consider the contribution of investment to wider economic change (Box 2.2); it should be noted that the conclusions did include the use of household interview data which may not necessarily be available in all LSTF Large Project areas[13]. This approach, assuming the use of consistent datasets and indicators, would also permit the comparison of observed outcomes with appraisal or ex-ante forecasts.

Limitations/Risks

A central limitation is that outcome focused methodologies will not necessarily generate evidence that can be used for future planning or knowledge production, as data may not be collected on the effectiveness of individual interventions or packages; this depends on the chosen geographical level of assessment. A purely outcomes monitoring approach also places limitations on the ability to explain anticipated and unintended outcomes or anomalies in outcome datasets; LSTF authorities must recognise this limitation and manage the expectations of stakeholders. Such weaknesses in approach are again highlighted by the Sustainable Travel Town analysis (Box 2.3).

Box 2.2: Case Study – Sustainable Travel Town Contribution Assessment

'Our evidence suggests that the car driver mileage by residents of the Sustainable Travel Towns fell by about 5%~7% (on trips <50km) during the course of the programme (household survey). This is likely to have helped reduce congestion and improve journey reliability. This is particularly likely to have been the case in the inner areas, where traffic count data shows reductions of the order of 6-9%.

Interventions targeted at school and workplace travel are likely to have been particularly important, because of their effect on peak hour trips. Car use for the journey to school fell by between 9% and 17% in the three towns (as measured by school travel surveys), and car driver distance for commuting fell amongst residents of two of the towns (as measured by the household survey, trips<50km).'

[14] See Section 9.26 of The Magenta Book for further guidance on the issues to consider to increase the power of evaluation designs.
[13] The Effects of Smarter Choice Programmes in the Sustainable Travel Towns: Research Report Sloman L, Cairns S, Newson C, Anable J, Pridmore A & Goodwin P (2010)

Box 2.3: Case study – Sustainable Travel Town Analysis (STT)

The detailed analysis of the STT datasets sought to consider the impacts of residential Personalised Travel Planning (PTP) on bus use, in isolation from other town-wide investment. The quality of patronage datasets varied between the multiple operators in terms of the timeframes available and disaggregation by ticket types. It was also not possible to disaggregate patronage on routes that operated in both urban and rural locations, leading to assumptions being required. Further limitations on the analysis were introduced by the contextual changes that had occurred during the intervention period, including:

- Changes in residential population;
- Changes in bus service routing and services;
- Changes in employment within the town;
- Ticketing initiatives including the introduction of concessionary fares; and
- Infrastructure improvements.

The STT detailed analysis team were able to conclude, following expert interrogation of datasets and delivery timeframes, that the PTP may have been successful in slowing the decline of bus patronage, but the multitude of factors influencing change made firm conclusions impossible. This highlights the importance of considering the *power of design*[14] when developing monitoring and evaluation programmes, to ensure that significant results can be determined within complex and noisy contexts.

Experimental Approaches

The aim of an experimental approach is to directly compare the impact of an intervention or group of interventions with an estimate or proxy of what would have happened anyway without the intervention i.e. the counterfactual. To undertake such an assessment, practitioners must analyse selected outcome indicators for two populations, one in receipt of the intervention and one without the intervention, with the latter used to represent the counterfactual. This is most commonly undertaken in relation to health initiatives, through the use of Randomized Control Trials[15], where the populations can be defined with high degrees of accuracy. The approach provides evidence that the intervention has been successful if the group receiving the intervention demonstrates significant changes in the outcome measure compared with the group not receiving the intervention (referred to as the comparison group[16]).

In principle, this approach is appropriate for LSTF investment as it can be adopted using monitoring datasets, although the challenges in analysing outcomes between the two populations should not be underestimated. Furthermore, as noted in the Magenta Book, the use of an experimental approach to assess public policy or complex intervention programmes where the selection of participants in not random can be problematic and should be considered carefully.

Benefits

An experimental design would provide an assessment of direct (rather than assumed) accountability, by the comparison of LSTF target areas with non-intervention areas or corridors. Experimental approaches are therefore again suitable for assessments that have an accountability focus such as the LSTF Large Projects.

To assist in controlling for the range of factors that will influence outcomes, within LSTF Project comparison areas should be selected i.e. comparing an intervention corridor and comparison corridor that are both within the same local authority boundary. This addresses directly the likely variations in policy or administrative systems that would be present if undertaking between-town comparisons. All non LSTF activities and investment in both intervention and comparisons locations should be recorded for the duration of the LSTF programme, as these may influence outcomes achieved. It should also be recognised that no two areas/corridors will be exactly comparable and therefore the interpretation of results will require the use of assumptions and local expertise.

[15] The Magenta Book. HM Treasury, P26.
[16] Comparison groups are used in quasi-experimental designs and control groups are used in full experimental designs such as RCTs.

Box 2.4: Case Study – Comparison Areas and National Data Benchmarking

The use of secondary datasets through which to make ex-ante benchmarking and ex-post comparisons with intervention areas has been commonplace in transportation evaluations. This has most commonly and successfully been achieved at the town or local authority level, reflecting first, the availability of data and, secondly, the complex challenges involved in delivering experimental evaluation approaches for transportation investment programmes. Examples of previously adopted approaches for comparing outturn impacts include:

- **Sustainable Travel Towns**: comparison of overall outcome trends with National Travel Survey (NTS);
- **Cycling Demonstration Towns**: comparison of increases in cycling using Active People Survey at authority level;
- **Urban Congestion Programme**: attempted to consider within urban area route comparisons but datasets were too 'noisy' resulting in authority level comparisons;
- **London Bus Initiative**: comparison routes considered but multiple confounding factors resulted in the analysis focusing on understanding detailed within route variations; and
- **West Midlands Red Routes**: as above, consideration was given to the use of comparison routes, but controlling for the multitude of factors and variability in background characteristics resulted in a quasi-theoretical approach being adopted.

Despite the limitation of between-town comparisons noted above, the use of comparisons at the local authority or town level can be appropriate where PTEs and LTAs wish to consider the importance of contextual factors in outcome results. It is also good practice to use nationally available datasets for benchmarking purposes (see Box 2.4). However, town level analysis and reporting will be unlikely to demonstrate significant changes in key indicators, where LSTF Large Projects are targeting specific areas/ corridors i.e. the change generated within intervention areas may be undetectable within the wider dataset due to the natural fluctuation and variability in data at the town level. The use of between-town comparisons will also require multiple control towns for those Large Projects that incorporate a number of urban centres; eg. Bristol and Hertfordshire.

Limitations/Risks

The central limitation of an experimental approach is that it does not explain why changes have occurred and attribution is difficult in complex urban environments. This approach can also be expensive as it is necessary to monitor both intervention and comparison populations to the same level of accuracy and coverage. Guidance also indicates that this approach is best adopted where the assessment is focused on a single outcome, rather than the interaction of several interventions and numerous outcomes as will be the case in most LSTF Large Projects. The approach is also methodologically challenging where interventions impact on target groups differently (for example disadvantaged and higher socio-economic groups). The ability to control the range of factors that could influence outturn impacts can be complex and resource intensive and assumptions made in interpreting data should be articulated.

Table 2.2: Issues for Consideration in Selecting Comparison Areas

LSTF Intervention Typology	Issues for Consideration
Public Transport	- Control for route or service changes through time - Different operators and ticketing arrangements in each area - Cross border (urban/rural) service similarity - Origin and destination patterns, trip distances etc on each route - Rail service comparisons difficult except where using suburban station catchments along the same line
Active Travel	- Topography such as hilliness - Socio-economic groups and income that may influence bicycle ownership - Proximity to key services and attractiveness of non-motorised modes - Existing public realm and severance - Cycle parking provision and security
Workplaces	- Characteristics such as size, sector, history, travel policy - Travel plans and coverage - Catchment areas for employees (inter and intra-urban) - Accessibility by all modes

The analysis of intervention and comparison areas/ corridors must recognise the limitations inherent within the data. Given the range of factors that may influence, promote or constrain change, and the potentially small levels of change anticipated in key indicators (for example, changes in cycling mode share may be small but will be from relatively low baselines) the ability to compare two populations robustly will be challenging. Changes in indicators may be due to LSTF or local contextual factors that must be understood before conclusions can be drawn. Some of the factors that would need to be considered and addressed if selecting comparison areas or routes for LSTF Large Projects are presented in Table 2.2 (examples interventions are presented and this is not an exhaustive list).

The nature of LSTF Large Projects, with multiple interventions being delivered in defined areas/ corridors where most interventions are open to influence multiple groups or sub-populations, could make the use of an experimental design very challenging. Although LSTF Large Projects are targeting specific groups, particularly the unemployed, the selection of control groups could be too mechanistic and constraining for LSTF assessment, and more detailed evaluation techniques such as those outlined in the next section may be more appropriate. Finally, if any uncertainty exists regarding the nature of change expected to be generated by LSTF interventions, then an experimental approach should not be adopted.

Theory-based Approaches

The use of theory-based approaches focuses on the testing of assumed connections between an intervention and the anticipated outcomes, understanding why an intervention has worked and in what context. Theory based approaches require additional data collection above standard outcome monitoring, using a wide range of research methods (interviews, surveys etc) to triangulate or compare evidence sources. Theory-based approaches are most commonly adopted where there is a knowledge production focus and would be most relevant to the evaluation of LSTF case studies; the approach is methodologically appropriate for Project level assessments but the budgetary requirements mean that this would not be recommended.

Benefits

Theory based evaluation approaches are particularly effective to assess large scale and complex programmes of investment, particularly over extended periods of say 3 to 5 years. The LSTF Large Projects, with multiple potential target groups, areas and delivery mechanisms would support such approaches, providing they are suitably designed to ensure sustainability and proportionality with investment levels. Although theory-based approaches are most commonly adopted where knowledge or learning is sought to aid future policy and design, elements could be used to enhance the quality and confidence of LSTF monitoring and evaluation procedures. Generating a better understanding of causality (i.e. the reasons for observed change and the mechanisms that were most effective) also assists in forecasting longer term (5 – 10 year) impacts of programmes. Theory-based approaches can also be used to test assumptions commonly adopted in transport appraisals, and are appropriate for the assessment of complex delivery programmes (providing that designs are carefully constructed to be commensurate with available resources and the level of investment). Finally, theory-based approaches are useful in the assessment of innovative or multiple interventions, to supplement traditional monitoring and to enhance understanding of observed change (see Box 2.5). As noted above, the application of theory-based approaches would be most relevant for specific case study evaluations.

Box 2.5: Combined Approach Using Extended Intervention Logic

The assessment of a business park targeted for a combination of workplace interventions could support a combined experimental and theory-based evaluation approach.

Traditional Monitoring

Monitoring programmes could be developed to accommodate both the intervention or target business park, and comparison businesses in similar locations. Data collection would focus on collating modal share information, traffic counts at site entrances and, where available, employer travel costs and expenses. This data would determine the level or magnitude of change in key outcome metrics.

Extended Intervention Logic

The extended intervention logic technique adopts elements of Theory of Change to supplement outcome/ monitoring activities, to provide answers to question such as why change occurred. This approach would add a knowledge component for LSTF. The steps to be adopted include:

- Collating baseline monitoring data alongside evidence from previous programmes to identify good practice;
- Developing an intervention logic map of the range of measures to be delivered;
- Collecting ex-post data on key indicators;
- Undertaking stakeholder interviews to obtain views on connections between outputs and observed outcomes and therefore why the measured change occurred; and
- Reviewing the causal pathways and, where necessary, refining or revising connections.

Limitations/Risks

The focus of theory-based approaches on understanding why changes have occurred and in which locations, does not map directly onto the primary objectives of LSTF Large Project assessments, and care should therefore be taken when adopting such methodologies. The costs of undertaking Theory of Change or Realist techniques can be expensive, diverting available resources away from delivering intervention programmes. The scale and scope of any theory-based explorations must be defined and costed during the baseline data collection period. No counterfactual is commonly developed using these approaches, although ex-ante appraisal forecasts can be used to inform the do-nothing scenario. Finally, the use of these approaches requires an element of objectivity by the evaluator, which can be difficult to achieve in self-administered assessments such as LSTF Large Projects.

2.4 Checklist and Conclusions

In summary, the assessment of LSTF Large Projects would support a predominantly outcome monitoring approaches, building on the strong foundations of existing LTP activities. Extended intervention logic and the use of quasi-experimental approaches are considered appropriate for selected case study areas, corridors or sites providing designs are carefully developed and are not excessively resource intensive. It remains important to keep the selected approach and method commensurate with available budgets, scale of investment and forecast scale of outturn outcomes. The following checklist has been prepared to support delivery teams in developing robust monitoring and evaluation frameworks or plans.

Checklist – Monitoring and Evaluation Approach		Section
✓	What is the overarching purpose of monitoring and evaluation, and what will the data be used for?	2.2
✓	At what investment level will monitoring and evaluation be undertaken?	2.3.1
✓	Have the characteristics of interventions and packages been defined and, where necessary, researched?	2.3.2
✓	Has the intervention logic been mapped and data gaps been identified? Is there a robust baseline of monitoring data?	2.3.2
✓	Has the evaluation approach been identified, and where combined approaches are to be adopted have the precise scope and scale of theoretical evaluations been defined?	2.3.3

03

The Building Blocks of Monitoring and Evaluation

3.1 Introduction

The previous Chapter has outlined the overarching principles of monitoring and evaluation and highlighted the importance of collecting robust outcome data. This Chapter sets out the building blocks that will be required in the delivery of a monitoring and evaluation programme for LSTF Large Projects. As outlined in Section 2.3.2 the central elements of monitoring and evaluation are defined as:

- **Inputs** – what is being invested in terms of resources;
- **Outputs** – what has actually been delivered;
- **Outcomes** – the short and medium-term changes such as traffic flows and modal share; and
- **Impacts** – the longer-term results such as economic growth, improved health and environmental benefits.

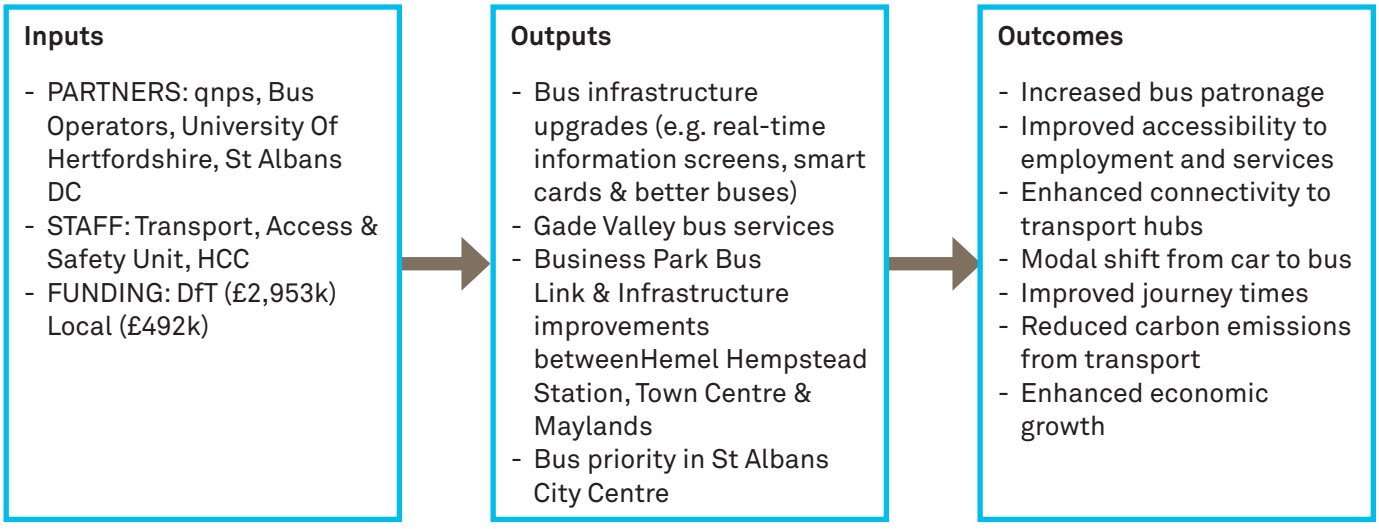
To support PTEs and LTAs in disseminating these definitions among project and delivery teams, Figure 3.1 presents an example of inputs – outputs – outcomes for a selected LSTF Large Project package. The remaining sections of this Chapter present guidance on monitoring inputs, outputs and outcomes.

3.2 Monitoring Inputs

Inputs refer to the financial investment, resources and processes applied to the implementation of an LSTF project. Although they can be challenging to quantify, these inputs play a critical role in the effective and efficient production of outputs, providing justification for ensuring that all are considered as part of a monitoring and evaluation programme. Robust data on the resources that were deployed to deliver the components of the delivery programme is a necessary prerequisite for calculating value for money (accountability) and gaining insight into the process factors (knowledge production) that enable successful delivery.

A key consideration in the monitoring and evaluation of LSTF Large Projects will be the extent to which the full range of inputs can be monitored, analysed and reported accurately. To support PTEs and LTAs in collating and collecting such data, Table 3.1 sets out the different types of LSTF inputs and guidance on what to collect when and how. It should also be remembers that different research questions, as set out in Chapter 2, will require different evidence sources, and the following example research questions are cross-referenced in Table 3.1 to help demonstrate this.

Figure 3.1: Hertfordshire BigHertsBigIdeas - Element B: Better Public Transport Services



Example knowledge production research questions:

1. What do external partners contribute to the delivery programme?
2. To what extent do staff skill sets enhance delivery?
3. To what extent do existing assets act as enablers in the delivery of the LSTF programme?
4. How are staff deployed to deliver the programme elements effectively?

Example accountability research question:

5. To what extent has the intervention/package delivered value for money?

Table 3.1: Types of Input Datasets

INPUT	DESCRIPTION
Human Resources Most relevant research questions: 4 and 5	**Why:** The allocation of financial investment to individual interventions is normally well-documented, supported by the standard PTE reporting and audit procedures. However, the allocation of staff time to individual interventions or packages can be more difficult to achieve robustly. To assess the value for money of LSTF investment it is important that staff time from across the PTEs and LTAs and delivery agencies is allocated where possible to specific elements of the LSTF project. **What:** Staff time and resources should be measured as Full Time Equivalents (FTE). For example: 2 people each working 4 hours per day, 5 days per week = 1 FTE where the standard working day is 8 hours. **How:** Employee timesheet systems are a commonly adopted mechanism of recording staff time against projects. However, the value of this data will be dependent on the extent to which project tasks are disaggregated in the timesheet system, allowing time to be attributed accurately to specific elements of an LSTF Large Project. Where timesheet systems do not exist or where the proposed monitoring requires a lower level of data resolution (i.e. monthly rather than daily), less formal systems should be adopted. This could include the use of a Microsoft Excel spreadsheet to record tasks and time allocations. A third alternative would be for staff to apportion their time to project tasks. **When:** Timesheet based methodologies permit the collection and allocation of time on a weekly and daily basis respectively. The use of more informal approaches should only be undertaken on a weekly or monthly basis depending on the defined analysis framework and duration of project or package delivery. Input data is unlikely to be used extensively in LSTF evaluations, with the possible exception of case studies, and the methodology should be proportionate to the intervention of package being assessed.
Financial Investment Most relevant research question: 5	**Why:** The DfT requires that financial expenditure on LSTF be submitted to them on an annual basis[17], broken down by 'scheme elements' as shown in the LSTF Large Project bid documents. However, this level of reporting will not allow for expenditure to be attributed to specific interventions or packages. If PTEs and LTAs are seeking to undertake evaluations at such levels it will therefore be necessary for financial data to be collected in a more disaggregated form. **What:** The monitoring of financial investment should include the DfT LSTF grant, local authority match funding, developer contributions, partner funding and other matched funding. Revenue and capital investment should be recorded and reported separately, as required by the DfT APR. Any substantive divergence from investment profiles and distributions between interventions/locations/ agencies should be recorded for auditing purposes. **How:** Good practice dictates that financial spreadsheets be used for the recording, collation and analysis of investment. Summary 'tabs' should also be provided to demonstrate overarching Large Project spend across all interventions. A common format should be established at the project level to ensure that consistent data is recorded where multiple departments and agencies are involved. **When:** Financial data should be collated and recorded on a quarterly and annual basis to ensure that anomalies and divergence from plan can be determined.

INPUT	DESCRIPTION
Delivery Partners Most relevant research questions: 1 and 5	**Why:** Delivery partners are likely to play a key role in the delivery of Large Projects by providing investment, expertise, assets, access to networks and enhanced access to target groups (e.g. the NHS has a track record of delivering market research and active lifestyle interventions, particularly to deprived communities). To enable robust value for money or economic evaluations to be undertaken it will be important that input data is collated from across the LSTF delivery chain. **What:** As noted above the financial investment delivered by the partners should be recorded alongside other 'contributions in kind'. The outsourcing of activities such as cycle training may result in the employment of new staff and such data should be recorded. Investment in equipment and materials should also be recorded, such as bicycles, leaflets and premises. **How:** It is essential that consistent and comparable data be collected from across delivery agencies to permit the assessment of LSTF outcomes. Clauses should be incorporated into Service Level Agreements that define the required data, format and frequency. Reporting tools and formats should be agreed before baseline data is collected. **When:** Given the complexity of LSTF Large Projects and the number of partners and agencies involved, it is recommended that data be reported to PTEs and LTAs on a quarterly basis for collation. Annual and end-of-commission progress reports (where delivery is broken down into smaller contractual commissions) should also be collated.
Existing Assets Most relevant research questions: 3 and 5	**Why:** This describes the infrastructure, equipment and software that is deployed in the delivery of the LSTF project. Whilst it is not feasible to calculate the entire asset contribution, it may be relevant to highlight instances where, for example, owning a building that could be used as a cycle repair workshop, negated the need to procure and prepare another property. Such data will be utilised in the assessment of value for money for particular investment approaches. **What:** Data should be collated on all assets purchased and owned through the delivery of the LSTF Large Project. **How:** As noted above, reporting tools and formats should be created before baseline data is collected, to ensure that consistent evidence is collated. **When:** The frequency of data collection on assets should be undertaken on an annual basis, to reflect the likely time periods for change to occur.

Checklist – Input data requirements (Section 3.2)	
✓	Which research question/s relate to the collection of input data?
✓	Have relevant input metrics been identified?
✓	Does the defined input data address directly the selected research questions?
✓	Have appropriate mechanisms been identified to capture relevant input data over the course of LSTF?

3.3 Monitoring Outputs

Outputs are defined as the interventions that have been delivered; for example, the number of cycle parking facilities implemented, the length of bus lanes, the number of training sessions or travel plans delivered. The links and relationships between inputs and outputs provide evidence through which to assess delivery efficiency (e.g. was the intervention delivered within time and budget) and quality (e.g. is the new cycle infrastructure to a standard that people will want to use). Such data are of particular relevance to the following types of research question.

The monitoring and reporting of delivery is recognised good practice, such as the preparation of Local Transport Plan Annual Progress Reports and as noted in the previous section the LSTF Annual Progress Report. The completion of the latter and the monitoring of delivery will require PTEs and LTAs to record data across a range of activities in a systematic and routine manner. Table 3.2 presents the summary of interventions to be recorded within the LSTF APR which should be seen as the minimum data to be recorded.

Example knowledge production research questions:

- What lessons can be derived relating to the most effective approach to implementation in different local contexts and under different local circumstances?
- What management and implementation processes are in place and how effective and efficient are these?
- To what extent do the management and implementation processes contribute to the relative success or failure of a LSTF intervention?

Example accountability research question:

- To what extent was the level of delivery (in terms of the number and extent of interventions) in line with the initial programme?
- What were the reasons for any substantive variation in delivery from that forecast?

Table 3.2: Base Information for Output Monitoring

Type	Intervention	Delivered (Y/N)
Public Transport	Bus infrastructure improvements	
	Bus service improvements	
	Bus information / marketing improvements	
	Rail improvements	
Active Travel	Walking and cycling infrastructure improvements	
	Skills training	
	Workplace active travel	
	Schools active travel	
	Access to cycles	
	Route planning	
Traffic Management	On road improvements	
	Vehicle-based initiatives	
Marketing and Engagement	Workplace engagement	
	Travel planning	
	Reducing the need to travel	
	Access to work	
	Marketing and communications	

It is recommended that this table be used as the basis for a template of additional output data, thereby providing PTEs and LTAs with a standard approach to recording and reporting information. Other output related data that should be recorded and the use to which each can be put, are summarised below:

- **Quantity of delivery:** As noted in the introduction, a core monitoring dataset should be the number of each intervention delivered. This should include the length or coverage of network improvements (bus lane KMs for example), the number of cycle training courses delivered or the changes in public transport service provision. This data would enable an assessment of the delivery rate and coverage across different locations such as areas or corridors;
- **Reach of delivery:** To enhance the quality of output monitoring it is recommended that the reach of interventions is also recorded. In line with items 21(vi) – 21(viii) of the LSTF APR this should include:
  - The number of people in the population being targeted, for example the resident population within a target area for PTP delivery;
  - The number of people being targeted within this population i.e. the target sub-sample; and
  - The number of people reached or engaged in the intervention.
- **Who delivered interventions:** A robust assessment of the outcomes of investment should, if resources permit, include the consideration of the consistency of delivery across Large Project areas. The characteristics of LSTF Large Projects, incorporating multiple urban centres, corridors and target areas, and the procurement structure of individual PTEs and LTAs may result in a number of delivery agencies working within the same thematic area i.e. delivering cycle training. As a minimum, a record should be kept of who delivered interventions in each location, and a commentary provided on the approach adopted by each delivery agency; for example there are a number of alternative approved delivery methodologies for cycle training which could influence the reach and quality of delivery.
- **Legacy of delivery:** An important measure of the success of LSTF investment will be the legacy embedded in local delivery and sustainable travel behaviours. PTEs and LTAs should therefore seek to consider, again where resources permit, the ability of delivery agencies and interventions to become self-sustaining beyond 2015.
- **Quality of delivery**: A further area of monitoring that PTEs and LTAs should consider is the assessment of the quality of outputs delivered. With the acknowledged focus of LSTF assessment being on outcomes there is a risk that a universal standard of interventions is achieved. Where investment is seeking to influence the awareness and perception of sustainable transport modes the actual and perceived quality of services will be an important consideration. Customer satisfaction surveys could be used to gather data on the quality of specific LSTF intervention (e.g. PTP, training, provision of a new bus service), providing lessons on future delivery and indications of the anticipated outcomes. Box 3.1 provides further options for assessing the standard of delivery in a cost-effective manner ; and technical appendix D provides more details on PERS

All of the above items of output monitoring should be the responsibility of the LSTF Large Project delivery team, including commissioned agencies and consultants. Data should be recorded at the smallest geographical level possible, such as corridor or area, and by delivery agency, with requirements outlined clearly within Service Level Agreements. Evidence should also be reported at Large Project level; Table 3.3 provides a template to support the high level reporting of output data with an example included for cycle training.

As set out in Chapter 2, logic maps can be used to identify data and monitoring requirements of an LSTF intervention/project. An example logic map for a school cycling programme is shown in Figure 3.2, demonstrating how output metrics have been selected. The illustrative output metrics are shown in Table 3.4.

Box 3.1: Monitoring the Standard of Delivery

There are a number of low-resource approaches to assessing the standard or quality of delivery, which use both professional and community derived evidence.

- **Site Audits**: Considering the basic level of service provided across the range of transport services, including site access, parking provision and signing.
- **Public transport audits**: covering at-stop facilities, the reliability of services, ease of boarding and alighting, and on-board comfort and safety.
- **Pedestrian Environment Review System (PERS):** An audit framework and software tool to provide standardised evaluations of streetscape provision. The following elements of public realm are scored by industry professionals from the end user's perspective, including that of vulnerable road users:
  - Links (footway sections);
  - Crossings (both formal and informal);
  - Public Spaces;
  - Public Transport Waiting Areas;
  - Public transport Interchange Spaces; and
  - Routes.

- **Community Audit**: The assessment, commonly adopted in urban regeneration projects, is based on community and professional opinion of the six individual audit components defined in PERS auditing. This approach therefore ensures that the scoring accommodates the views of the local population.

Figure 3.2– Example Logic Map for Schools Cycling Programme

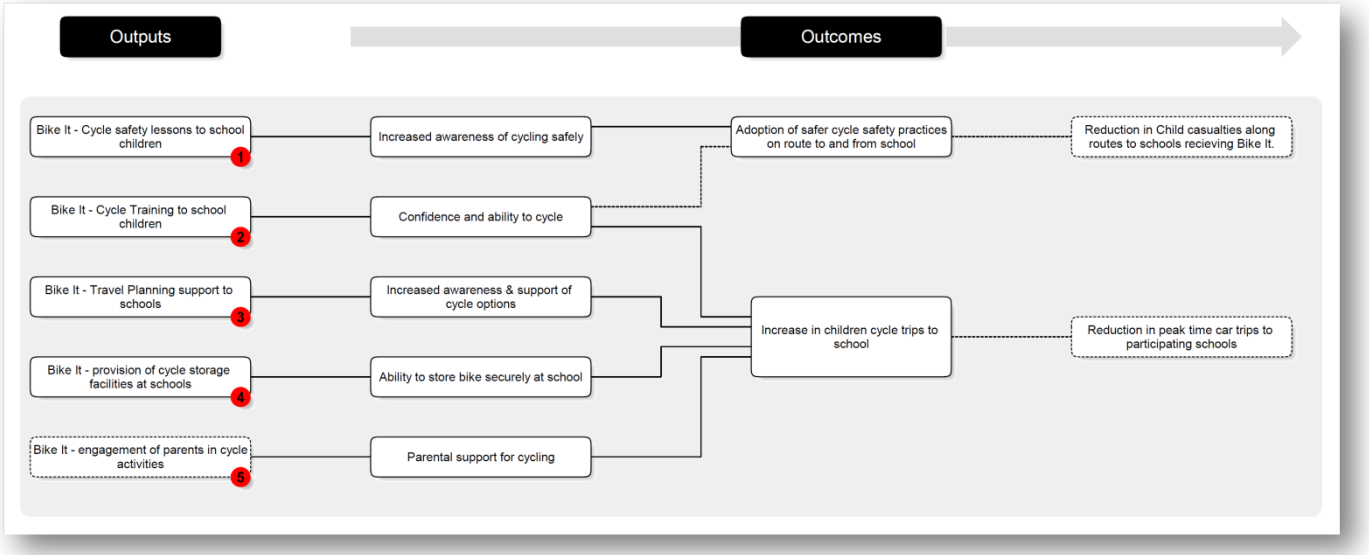


Table 3.3: Reporting Template for Outputs

		Quantity of Delivery			Population Reach			Delivery Method		
Type	Intervention	Delivered (Y/N)	Quantity of Delivery	Completion (%)	Total Population	Target Sample	Achieved Sample (%)	Delivery Agency	Method of Delivery	Legacy (Y/N)
Public Transport	Bus infrastructure improvements									
	Bus service improvements									
	Bus information / marketing improvements									
	Rail improvements									
Active Travel	Walking and cycling infrastructure improvements									
	Skills training	Yes	35 courses	50% of 70 courses planned	800 Year 6 school pupils	400 Year 6 pupils in selected schools	360 pupils (90%)	CTC	Level 2 on-road approach	No
	Workplace active travel									
	Schools active travel									
	Access to cycles									
	Route planning									
Traffic Management	On road improvements									
	Vehicle-based initiatives									
Marketing and Engagement	Workplace engagement									
	Travel planning									
	Reducing the need to travel									
	Access to work									
	Marketing and commu-nications									

Table 3.4: Example Output Metrics

ID	Metric	Potential Data source
1	a) Number of schools receiving cycle safety lessons b) Number and % of children receiving cycle safety lessons	- Local Authority Delivery data - Delivery agency data
2	a) Number of schools receiving cycle training b) Number of schools receiving cycle maintenance lessons c) Number and % of children receiving cycle training d) Number and % of children receiving maintenance lessons	- Local Authority Delivery data - Delivery agency data - Activity Log - Bike It officer intervention diary
3	a) Number of schools receiving travel plan support	- Local Authority Delivery data - Delivery agency data
4	a) Number of schools receiving cycle storage facilities b) Number of cycle storage places delivered	- Local Authority Delivery data - Delivery agency data
5	a) Number of parents participating in cycle activities through Bike It	- Local Authority Delivery data - Delivery agency data

There are a number of approaches to recording output data of relevance to LSTF Large Projects. The use of an intervention or project diary has been adopted on previous large scale transport programmes (e.g. Sustainable Travel Towns) to record the delivery of activities or interventions. Such an approach can also be used to record contextual information associated with the delivery of investment, including possible reasons for delays, confounding factors, barriers to delivery or national activities that may influence the awareness or take-up of activities.

Delivery data should also be collected by all delivery partners through the inclusion of relevant clauses within Service Level Agreements. PTEs and LTAs should work closely with delivery partners to establish output monitoring requirements such as the format of data collection and the timetable for data receipt. PTEs and LTAs should also identify the precise delivery approach of each partner so as to identify any variations across thematic areas or locations.

Checklist – Output data requirements (Section 3.3)	
✓	Has the scope of output monitoring been defined?
✓	Have the relevant datasets and indicators been defined?
✓	Have all stakeholders and delivery agencies signed up to providing output data?

3.4 Assessing Outcomes and Impacts

3.4.1 Introduction

Outcomes and impacts are defined as being the consequential changes that occur (e.g. changes in mode share or carbon emissions) as a result of the outputs that have been delivered. A prerequisite to selecting outcome metrics and datasets is to identify what exactly is being monitored and evaluated. As it may not be feasible to monitor and evaluate all aspects of the LSTF project, it is critical to prioritise specific interventions and geographical areas to focus upon. Factors to consider in this prioritisation process may include:

- **Local priorities** – there may be local requirements to demonstrate accountability for a specific intervention, particularly if they are high profile or politically sensitive. Similarly there may be a desire to generate knowledge production about new and untested interventions (e.g. support for Ultra Low Emission Vehicles);
- **Availability of existing datasets** – collecting data can be expensive, so monitoring may be focussed around interventions where data is already being collected locally (e.g. traffic counts, STATS19, travel surveys) and what data is already freely available from other organisations (e.g. passenger surveys, national census data); and
- **Measurable outcomes** – a key question is whether or not the anticipated outcomes of an intervention are measurable. For example, the outcomes of a PTP intervention may be too small to be measurable on the road network; however a follow up survey of participants would provide outcome data on those individuals.

Logic mapping can be used to help develop outcome metrics by identifying anticipated outcomes and therefore opportunities to monitor. An example of this process is illustrated by Figure 3.3 and Table 3.5. The more immediate outcomes of any activity are a change in less tangible but nonetheless important aspects of behaviour change such as changes in awareness or knowledge. However, it is often the case that these outcome datasets are not routinely captured. In some cases, an opportunity to fill these data gaps is presented at the point of delivery (e.g. after a training programme) and may be built into contractual requirements of delivery. This data makes it possible to go some way to attribute interventions to observed outcomes (e.g. did participants in a beginners bike day feel more confident afterwards? Were observed changes in cycling related to the intervention?).

LTP data collection has been focused on capturing changes in behaviour, such as a shift in mode share (e.g. workplace travel surveys) or a reduction in traffic through reduced car use (e.g. count data). In addition to traffic count data, datasets such as Traffic Master (Box 3.2) provide continuous monitoring of vehicle movements through GPS technology.

Box 3.2: Traffic master

Traffic Master GPS data provides baseline information for selected sections of the highway network. Updated data is provided to local authorities at regular intervals by the DfT. Key corridor data can be sought from the data set, with travel time and link based information included. The dataset can be analysed to determine variation in term and non-term time travel. Traffic Master data can be analysed and associated with traffic count data to produce link based information by different times of day on:

- Delay per vehicle;
- Total delay (delay per vehicle x traffic flow);
- Delay per vehicle per mile (can be used to calculate carbon impacts);
- Total delay per mile; and
- Economic costs of delays (using WebTAG values).
- It is possible to present such data using GIS platforms to prepare high quality visual representations of the data.

The dataset is extensive in urban areas particularly where there are high traffic flows meaning that it can be disaggregated by specific corridors and time frames along those corridors (e.g. term and non-term time travel on key corridors). The data is released regularly providing interim measures during the delivery period. As collection is continuous and is available over long timeframes it is suitable for trend analysis and measuring sustainability of outcomes. The versatility of this dataset fits well with the data requirements of LSTF projects, particularly in using journey times to calculate economic and carbon of interventions targeted at specific geographic areas or along key corridors. However, the sheer volume of data does mean that effective analysis can be resource intensive.

Figure 3.3– Example Logic Map for Schools Cycling Programme

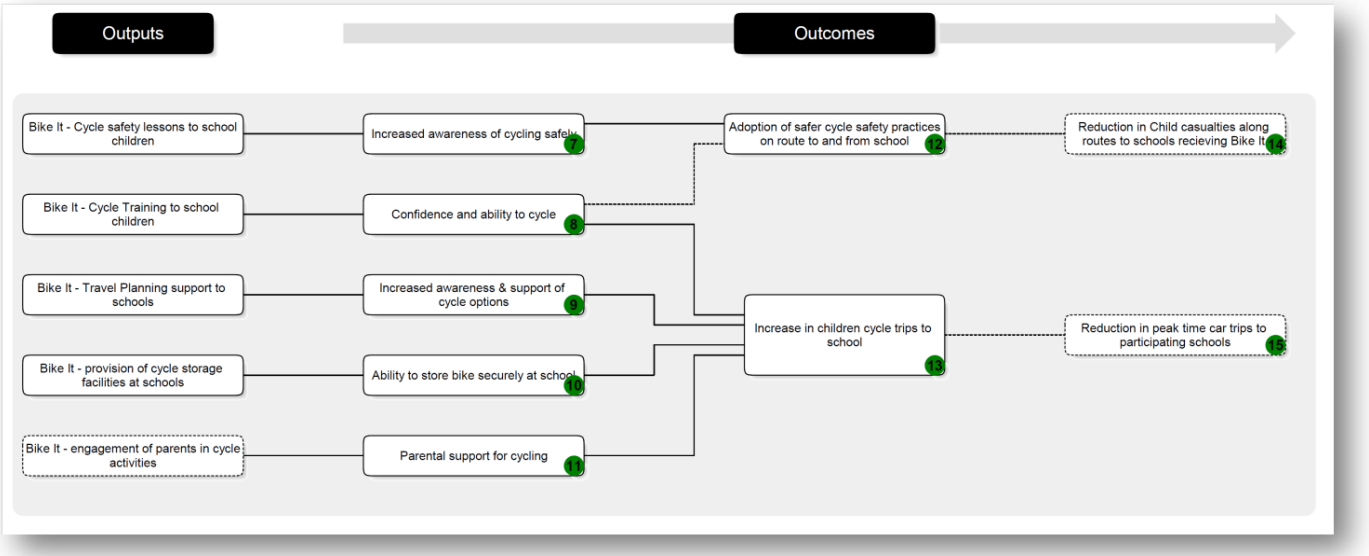


Table 3.5: Example Outcome Metrics

ID	Metrics	Potential Dataset
7	a) Proportion of children demonstrating awareness of cycle safety	- Classroom survey
8	a) Number of children able to cycle	- Classroom survey
9	a) Number of children aware of route to take to cycle to school b) Number of children who have ever cycled to and from school and their current address	- Classroom survey
10	a) Number of bikes parked (formally and informally) at school b) Number of cycle storage facilities at target schools	- Cycle parking counts
11	a) Number of children whose parents cycle with them	- Classroom survey
12	a) Number of children at target school and age group who cycle 'safely'	- Observational survey
13	a) Proportion of children who 'usually' cycle to school b) Proportion of children who cycled to school yesterday	- PLASC / classroom 'hands up' survey
14	a) Number of child casualties occurring on the journey to and from school	- STATS19 data
15	a) Morning peak traffic flow (car miles) along the key corridors b) Morning peak journey times along the key corridors c) Modal split of peak flows along key corridors	- TrafficMaster data

3.4.2 Data collection requirements

It is critical that data collection programmes are designed so that the data collected is robust and fit for purpose. For example, a manual cycle count is of limited value if it is undertaken at an unrepresentative time of the year, or on just a single day. The key data issues to consider are set out under the following sub-headings.

3.4.2.1 Time Series

At a minimum, outcome data needs to be collected before (baseline) and after the delivery of the intervention(s) being monitored. Outcome data can also be collected during the project delivery period; this interim data can be used to inform the ongoing direction of delivery, checking if progress is on track and indicating whether any changes need to be made. If several years of pre-delivery data is available, trend analysis should be undertaken to consider the pre-LSTF fluctuations.

3.4.2.2 Frequency of collection in defined time period

The ability to identify statistically significant changes will be increased by collecting data over longer periods. This permits the identification of natural fluctuations in data between days of the week or months of the year. However, the duration of data collection must be a compromise between the level of robustness provided and the associated costs. It should also be noted that collecting data over a longer period may not overcome any systematic sampling bias inherent to the survey design eg. a four week workplace travel survey (such as the Jambusting June approach) will provide a better understanding of travel patterns than a one day survey, but the level of participation and characteristics of respondents may still be skewed. Table 3.6 provides some examples of good practice minimum data collection periods for some of the key LSTF datasets. Important consideration should be given to factors such as the time of year (this should align with previous and future surveys) and contextual issues such as the weather or road works that could bias results.

Table 3.6 – Example data collection requirements

Data type	Minimum data collection requirements
Cordon Count (ATCs and Manual)	**Cordon Count (ATCs)** - 2 week period minimum data collection period - 24hrs/day - Collect in Year 1 (baseline) and Year 3 **Manual Count** - 5 day minimum data collection (1 day data collection for validation of ATCs) - 12 hour period (07:00-19:00) - Aligned with ATCs - Collect in Year 1 (baseline) and Year 3
Public Transport Patronage Survey	- Collect in Year 1 (baseline) and Year 3 - Use 3 to 5 year baseline trends where available
Staff Survey	- Spring or autumn representative months - Record travel over 7 days minimum - Collect in Year 1 (baseline) and Year 3

3.4.2.3 Coverage

Data collection should be targeted carefully at locations where it is anticipated that there will be measurable changes as a consequence of the LSTF interventions. Targeting outcome data collection at locations which have received investment strengthens the attribution of any observed changes to the interventions being delivered.

For example where interventions are aimed at a specific site (such as a public transport station or business park), manual and automatic cordon counts may be located to capture traffic at the each of the access routes. The data coverage will vary by user group, for example automatic counts are not sufficient to capture pedestrian movements or public transport patronage. Public transport operators are often reluctant to provide data disaggregated to specific corridors or locations due to commercial sensitivities, so other methods of data collection (e.g. manual counts or surveys at origins / destinations) should be considered in these cases.

3.4.2.4 Quality of Data Quality of data

It is necessary that datasets are fit for purpose and able to provide robust evidence to establish accountability / knowledge production. Issues to consider include:

- **Sample size** – is the sample size sufficient to provide statistically significant results? What is the size of the sub-group being measured and what is the anticipated level of change in behaviour? If the sub group and / or anticipated change in behaviour is too small, it's unlikely to be measurable through area traffic counts or panel surveys.
- **Methodology used** – it is important that a methodologically robust approach is used to ensure that the data is fit for purpose. For example a poorly designed questionnaire may provide misleading results or a cycle parking survey that only counts formally parked bikes will miss the suppressed demand of informally parked bikes;
- **Confounding factors** - aside from the LSTF investment there are many factors that may affect observed changes in travel behaviours. For example, a road closure, weather conditions or a special event taking place at the time of data collection. These factors should be taken into account where possible in the planning of data collection and if relevant, confounding factors should be recorded to give context to reported results; and
- **Data validation** – where possible, multiple data sources can be used to validate each other and provide greater confidence in the reliability of data or flag up issues with a specific data source. For example, manual counts may be used to 'calibrate' automatic counts.

3.4.2.5 Data Ownership

In order to keep track of data and ensure its timely collection, analysis and reporting, it is important to identify the individuals who are responsible for the collection and management of the relevant dataset. These data owners may be working in several different

parts of the local authority, in neighbouring authorities or in other external agencies particularly if the data is not specifically related to transport (e.g. data on health, education, air quality, etc.).

3.4.2.6 Data Collection Costs

The cost of data collection means that it is important that data requirements are planned carefully and rationalised (i.e. targeted at specific user groups or areas) in a way that will provide sufficient data to answer the evaluation research questions. There may be a requirement for research questions to be reworked in light of the anticipated cost of the data requirements. In particular, research questions associated with knowledge production may have higher data requirements than accountability questions as they require in-depth interviews with target groups.

3.4.2.7 Confounding Factors

It will be difficult to attribute changes in behaviour to the specific interventions where there may be many other factors contributing to observed changes in behaviour. Examples of the types of factors that may contribute to observed changes in travel behaviour and which should be considered include:

- **Residential / retail / business park developments** – new developments may generate higher levels of commuter and shopping trips along adjacent areas of the network.
- **Infrastructure changes** - Roadworks associated with new developments or maintenance by utility companies may significantly influence localised journey times. Bus lanes may act to actually increase congestion along road sections where the car user capacity has been reduced.
- **Economic activity** – a decrease in local and national economic activity and the increase in fuel prices may contribute to an underlying downward pressure on the growth in congestion
- **Local / National events** – the impact of events such as the Olympic games or Tour de France may galvanise interest in activities such as cycling for example
- **Suppressed demand** – whilst interventions may have been successful in persuading individuals to change their travel behaviour, the observed effects of this in terms of journey times may be dampened by other individuals taking advantage of the journey time improvements and opting to switch to using their car.

3.4.3 Panel Survey

The use of a household or business panel survey could provide quantitative and qualitative data relevant to both accountability and knowledge production research questions; a panel survey involves the recruitment of respondents for a baseline survey, the maintenance of the panel throughout the delivery period and the re-surveying of the same individuals in the ex-post period. The use of a panel survey reduces the reliance on observed changes, which as highlighted previously is fraught with risks because any behaviour changes from LSTF may be lost in the 'noise' of other contextual factors. The panel survey strengthens evidence on the likely contribution of LSTF interventions to observed outcomes by directly gathering evidence on those targeted by specific interventions. For example the survey may cover the following areas:

- A detailed one-day travel diary for the previous day;
- Information on use of transport;
- Perceptions of travel and transport;
- Views of local neighbourhood;
- Information about personal health and physical activity levels; and
- Personal and household information.

To generate robust evidence it is important that the survey is representative of the targeted groups. In the context of a residential area, this requires data on the socio demographic makeup of community and the setting of survey quotas to reflect this data. To collect data on employees (a key LSTF target group), panel surveys may also be carried out at workplaces (Table 3.7). In the delivery of a panel survey it is critical to consider the sample size required to measure anticipated changes. Where sub-groups or anticipated changes are very small, the sample size required may be unfeasible given local budgets (see Box 3.3).

Table 3.7: Residential and Business Panel Sampling

Residential	Businesses
- Use of social media (facebook, twitter) as recruitment mechanism - Residential sample will stratified by MOSAIC user groups - Within the resident group representation may be required of specific sub-groups, for example from trainees/first rung employees (aged 18-24 years old) and resident commuters (aged 35-55 years) - Cost effective methodology is to undertake baseline survey at the point of recruitment	- Selection of workplaces at a specific location (e.g. business park) or a sample of workplaces throughout the study area. - Telephone recruitment with covering email / letter in advance has been found to be the most cost effective method for business panel recruitment - Use target sample as case studies for more detailed consultations

Box 3.3: Panel Survey Sampling

There are a range of factors that need to be considered when surveying a sample of the population:

Who is your target population? The sample must represent the characteristics of your target population. This will also have implications about when and where the survey is undertaken. For example if commuters are part of your target population, it's important that household surveys are undertaken in the evening, when they have returned from work.

Sample Size	Confidence Intervals (95%) 50% Viewpoint %
50	13.9
100	9.8
200	6.9
300	5.6
400	4.9
500	4.3

How precise the estimates need to be. This is in part dependant on the type of results expected, the smaller the results, the greater the level of precision required. This is gained by increasing the sample size thereby narrowing the 'confidence interval' so the balance is between accuracy and cost. A confidence interval is normally expressed as a range. *For example: '20% of commuters use public transport +-5%', providing a range of 15-25%. As a rule of thumb a confidence interval of +-3% can be achieved with a sample size of 1100. However when measuring small population subgroups (such as commuter cyclists) which comprise just 1-3% of the adult population, even a confidence interval of +-3% is clearly inadequate. Therefore panel surveys are less useful for measuring changes in sub groups of this scale.*

If there is any interest in changes over time – the anticipated levels of change will have a big impact on the scale or usefulness of a survey. *For example: even a large change of 50% increase in cycling levels, can require a relatively large sample size because the size of the cycling subgroup within the overall population is so small. A baseline survey may show that 2% of the adult population cycle (with +-3 confidence interval that would produce a range 0-5%) if the ex-post survey is expected to show a 50% increase in cycling to 3% of the adult population the confidence interval will produce an overlap that undermines the statistical significance of the results (the target range would be 0-6%, a considerable overlap with the baseline).*

Checklist – Outcome Data Requirements (Section 3.4)	
✓	Have outcome metrics been selected?
✓	Have appropriate datasets been identified?
✓	Has sufficient resolution, quality and robustness of data been ensured to contribute to Research Questions?
✓	Has additional data collection been commissioned to fill identified gaps?
✓	Have all external data owners been identified?

04

Assessing Economic Impacts

4.1 Introduction

The importance of transport for developing a sustainable economy has been demonstrated in numerous studies, including the Eddington Transport Study[18] which outlined clear evidence of how a comprehensive and high-performing transport system is integral to enabling sustained economic prosperity. Connectivity, a key facilitator of economic activity, is influenced by the spatial distribution of businesses and households, the transport costs (time, money and inconvenience) involved in moving between them and the transport dependency of the economy (propensity to travel per unit of Gross Value Added). This means that changes in transport supply or changes in transport demand affect the connectivity a place can offer and thus the Gross Value Added it can support. The focus of many LSTF Large Projects is on increasing the accessibility and connectivity of people and employment/services particularly among economically deprived communities. This will generate potential short and medium term changes in the use of the transport network and the level of economic activity thereby supported.

The monitoring and evaluation of the economic impacts of LSTF Large Projects is a potentially complex and resource intensive activity. It will be important to keep the approach and method commensurate with the available budget, scale of LSTF investment under consideration and the forecast scale of outturn impacts; if the level of forecast change is small the required data collection and sampling will be high depending on the individual metric. Economic evaluations focus primarily on two measures of change, employment and income, within which the following could be assessed for LSTF projects:

- Direct employment impacts of the delivery of LSTF Large Projects;
- Direct employment benefits generated by LSTF interventions, including through enhanced accessibility to jobs and training;
- Direct business cost savings as a result of enhanced accessibility and reduced travel-related costs;
- Decongestion benefits generated by LSTF investment; and
- The wider impacts on economic income (Gross Value Added).

The guidance presented herein includes approaches through which the Large Projects can monitor economic impacts in a cost effective manner, building on existing datasets and modelling platforms. The methodologies are also flexible for use at various geographical levels, although some datasets cannot be disaggregated below local authority or district levels; these constraints are identified where relevant. Alternative approaches are presented, supporting more complex and extensive assessments, such that PTEs and LTAs can select an approach they consider robust and appropriate to their Large Project scope. This includes the analysis of changes in network efficiency and car mileage to determine wider economic benefits (time and cost savings), where high levels of congestion prevail. This section begins with an overview of the scoping of economic monitoring and evaluation, before presenting methodologies for the three areas of economic impact identified in the

[18] The Eddington Transport Study – The Case for Action, 2006

following section.

4.2 The Economic Impacts of LSTF

In developing proportionate methodologies for the assessment of economic impacts, LSTF Large Project teams should first consider the type of change anticipated, secondly the specific focus of evaluation and thirdly the additional benefits accrued.

4.2.1 Typology of Economic Impacts

The first action in defining the scope of economic monitoring and evaluation should be the clear articulation of anticipated impacts for each Large Project. LSTF delivery teams should define clearly the areas of economic influence that their Projects will have, so that the necessary data collection can be considered and prioritised. To assist PTEs and LTAs in this exercise, Table 4.1 presents a summary of key metrics of economic change of relevance to LSTF. Some of these metrics are measures of direct change, whilst others are proxies for economic change, requiring additional analysis. LSTF Large Projects are likely to include a range of these metrics from across the three typology groups.

Table 4.1: Typology of Economic Impacts for LSTF

Proposed Typology	Metrics for the Economic Evaluation of LSTF
Direct employment benefits	- Employment generated by delivery of LSTF i.e. bus drivers, cycle trainers - Enhanced accessibility (perceived and actual) to training and employment opportunities i.e. increasing accessibility of employment sites by non-car modes through the provision of dedicated public transport routes to edge-of-town locations - Enhanced access to labour markets and workforce for local businesses i.e. support the filling of employment vacancies in business parks and enterprise zones with existing poor non-car accessibility, thus changing the origin-destination patterns and travel modes of employees - Enhanced accessibility to regeneration and development areas and associated in-migration of businesses - Reduced jobseeker costs due to increased accessibility and take-up of employment - Reduced business related travel costs (eg. fuel costs and accident claims)
Congestion relief/ network efficiency	- Change mode share at peak periods to non-car modes - Journey time savings and better reliability for businesses and individuals - Reduced car-based mileage and total car-based mileage per employee - Reduced road traffic accidents and associated costs - Promotion of walking and cycling to improve physical activity levels and associated health/ absenteeism - Enhanced network capacity and resilience for accommodating future economic growth - Business cost savings from reduced car use i.e. parking provision
Wider (spatial) economic benefits	- GVA and income changes at town level - Improvements in market conditions, including increased profitability and turnover - Increased employment opportunities and skill levels - Increased willingness to join labour market - Increasing the proportion of the local population in employment - Increased viability of public transport services - Promoting town and district centre vitality, viability and competitiveness, including the attraction of new businesses - Encouraging increased retail activity among local and visiting populations

To further aid PTEs and LTAs in defining the scope of economic evaluation, Box 4.1 provides a hypothetical case study for the impacts of investment on an edge of town business park. This has been built on the Jobconnector bus services proposed in the South Yorkshire PTE business case. In this instance the monitoring and evaluation focus would most likely be on the direct economic benefits as the scheme is seeking to change accessibility levels to selected sites. The scheme is unlikely to impact on traffic flow, and decongestion impacts will be low as baseline peak period congestion is not high.

4.2.2 Scope of Economic Evaluation

Alongside the nature of economic change anticipated, LSTF teams must also determine the specific focus of economic monitoring and evaluation. The DfT has highlighted three elements of economic evaluation that provide a useful basis to determine the scope and priorities of Large Project assessment:

- Identifying the **direction** of economic change (i.e growth or retraction), potentially using a range of datasets through which to determine the direction of movement for each metric;
- Determining the **magnitude** of economic impacts (the overall level of change), requiring an absolute measure of economic outcomes for use in accountability focused evaluations; and
- Understanding the **mechanisms** through which such change has occurred (what influenced change), where knowledge production or attribution are an integral element of an evaluation.

The direction of economic change will be the easiest to determine, as this can be considered using a number of indicators and a combination of quantitative and qualitative evidence. Stakeholder views, for example, on trends in investment, expenditure and turnover can be obtained relatively inexpensively and used to supplement quantitative data. Understanding the mechanisms underlying change is likely to be complex and only relevant to LSTF Large Projects where there is an agreed requirement or need to consider absolute attribution. The methodology for identifying and quantifying the magnitude of change, such as employment or Gross Value Added (GVA)[19], should be considered carefully as the costs of data collection could be extensive. The guidance presented herein highlights the ability and robustness of evaluating these factors for LSTF. The application of different methodologies at various geographical scales is also addressed, to assist PTEs and LTAs in defining the appropriate level for assessment.

Box 4.1: Case Study – anticipated economic impacts

The South Yorkshire Jobconnector Microbus services are to operate to provide connectivity to deprived neighbourhoods:

- **Direct Benefits:**
  - Employment generated by LSTF i.e. bus drivers operating on new routes to business park;
  - Enhanced accessibility to employment site by public transport;
  - Enhanced access to labour markets and workforce for local businesses;
  - Reduced jobseeker costs due to increased accessibility and take-up of employment;
- **Congestion Relief:**
  - Business cost savings from reduced car use i.e. parking provision
- **Wider Economic Benefits:**
  - Increasing the proportion of the local population in employment, with associated health and disposable income benefits.
  - Increased viability of public transport services

[19] GVA measures the contribution to the economy of each individual producer, industry or sector in the UK.

Figure 4.1: Equation of Additionality[20]

4.2.3 Measuring Additionality

LSTF Large Projects are likely to have a range of impacts on local and regional economies, producing a complex environment in which to undertake evaluation. It is also likely that interventions will have both positive and negative impacts during the course of the programme, and potentially after the three year investment period has ended. The evaluation of the economic impacts of LSTF Large Projects must therefore identify and take account of both the positive and negative changes, through which to identify the additional benefit generated or the additionality of the project. The assessment of additionality is good practice in economic assessments, which seek to determine the difference between what would have happened anyway in the absence of the intervention (referred to as the reference case, deadweight or counterfactual) and the outturn conditions with the intervention in place (Figure 4.1).

In assessing additionality, the gross impacts must be adjusted to take account of issues such as leakage and displacement (defined in Table 4.2), so as to determine the net impacts. Standard factors (see Table 4.8 in Section 4.5), developed through economic research, are available to support the assessment of such issues out. However, the extent to which LSTF Large Projects will generate displacement is highly dependent on the individual project scope and local conditions. The priority for PTEs and LTAs should be on defining the rationale for the level of assumed displacement (as well as leakage and multipliers) and justifying the factors and evidence used. The views and support of local stakeholders should also be sought, to validate the decision making process. Resources should not be used to identify the absolute level of leakage, displacement and multipliers where this would require extensive additional data collection.

Table 4.2: Factors to be Considered in Calculating Net Impacts

Net Factors	Definition
Leakage	The proportion of outcomes that would benefit those outside the LSTF programme area.
Deadweight	The level of outcomes that would have occurred anyway, in the absence of LSTF.
Displacement	The proportion of the outcomes that are accounted for by a reduction in outcomes elsewhere in the LSTF area.
Multiplier	The further economic activities (jobs, expenditure and income) associated with additional local income and supplier purchases.

Once the net impacts have been defined, the reference case or counterfactual needs to be determined, and thereby the additional impacts generated by LSTF estimated. In defining or seeking to measure additionality, LSTF delivery teams should consider:

- The *scale* of additionality in terms of the level/ quantity of turnover, employment or GVA created;
- The *timing or phasing* of additionality, where benefits may have been brought forward or expedited by an intervention; and
- The *quality* of additionality in terms of the level of employment created or enhanced skill provision.

The common focus of economic assessments is on the scale or magnitude of change. However, it is recommended that the issues of timing and quality are also considered to enhance the depth of LSTF assessments depending on the nature and scope of LSTF impacts.

[20] This figure has been adapted from the Additionality Guide, English Partnerships, 2004.

Checklist – Economic Evaluation Approach		Section
✓	Has the precise nature of anticipated economic impacts been defined, in terms of direct employment, congestion relief and wider economic benefits?	4.2.1
✓	Has the scope of economic evaluation been agreed and does the scope of data collection correctly reflect the agreed coverage?	4.2.2
✓	Has the coverage of additionality been defined and agreed (scale, timing, quality)?	4.2.3

4.3 Direct Economic Benefits of LSTF

The direct economic impacts of LSTF investment can be measured in three ways, two relating to the employment impacts and one considering the short term cost benefits of local businesses. These approaches are not mutually exclusive and all may be relevant to a single Large Project.

4.3.1 Direct Employment of LSTF Investment

The most direct economic benefit associated with the LSTF Large Project investment will be the employment generated in the delivery of the projects themselves. This will include employment associated with the design and delivery of LSTF interventions, both within PTEs and LTAs and also that associated with expenditure on professional services. The potential impacts should also not be underestimated, particularly where delivery agencies operate a business model focused on locally sourced employment which also extend beyond the duration of the three year LSTF programme. Discussions should be held with supply chains to determine the level of employment anticipated.

The most accurate methodology for identifying employment generated by LSTF delivery is through the collection of detailed input data. Section 3 has outlined methodologies for the direct monitoring and reporting of inputs to LSTF delivery, and this should identify the most common employment generated by LSTF projects (examples are provided in Table 4.3 to guide PTEs and LTAs). It is assumed that internal PTE employment will be estimated as Full Time Equivalent (FTE) positions. Of particular importance will be the collection of employment data by organisations commissioned to deliver thematic areas of Large Projects, such as cycle training and maintenance.

Table 4.3: Examples of Direct Employment Anticipated by LSTF

LSTF Typology Category	Examples of Direct Employment
LSTF Delivery Authorities	- Officers employed to develop and deliver interventions - Full and part time officers - Chief executive officers
External Delivery Agencies	- Consultants (including secondees) - Delivery agencies
Public Transport	- Bus drivers on new or expanded routes
Active Travel	- Cycle trainers - Dr Bike officers - Walking guides - Bike leasing managers - Personalised Travel Planning officers and fieldforces

The collection of input data from suppliers and delivery agencies can be secured through clauses within Service Level Agreements; common data templates should also be developed to ensure comparability. Sub-contractors should be requested to collect data on the number of employees, their place of residence, their previous employment status, sector and location. This will assist in the direct consideration of the net employment impacts (Figure 4.2). As outlined in the previous section, a combination of standard factors, local knowledge/stakeholder views and quantitative evidence should be used to derive agreed levels of leakage and displacement (see Table 4.4 for examples).

Figure 4.2: Net Employment Assessment

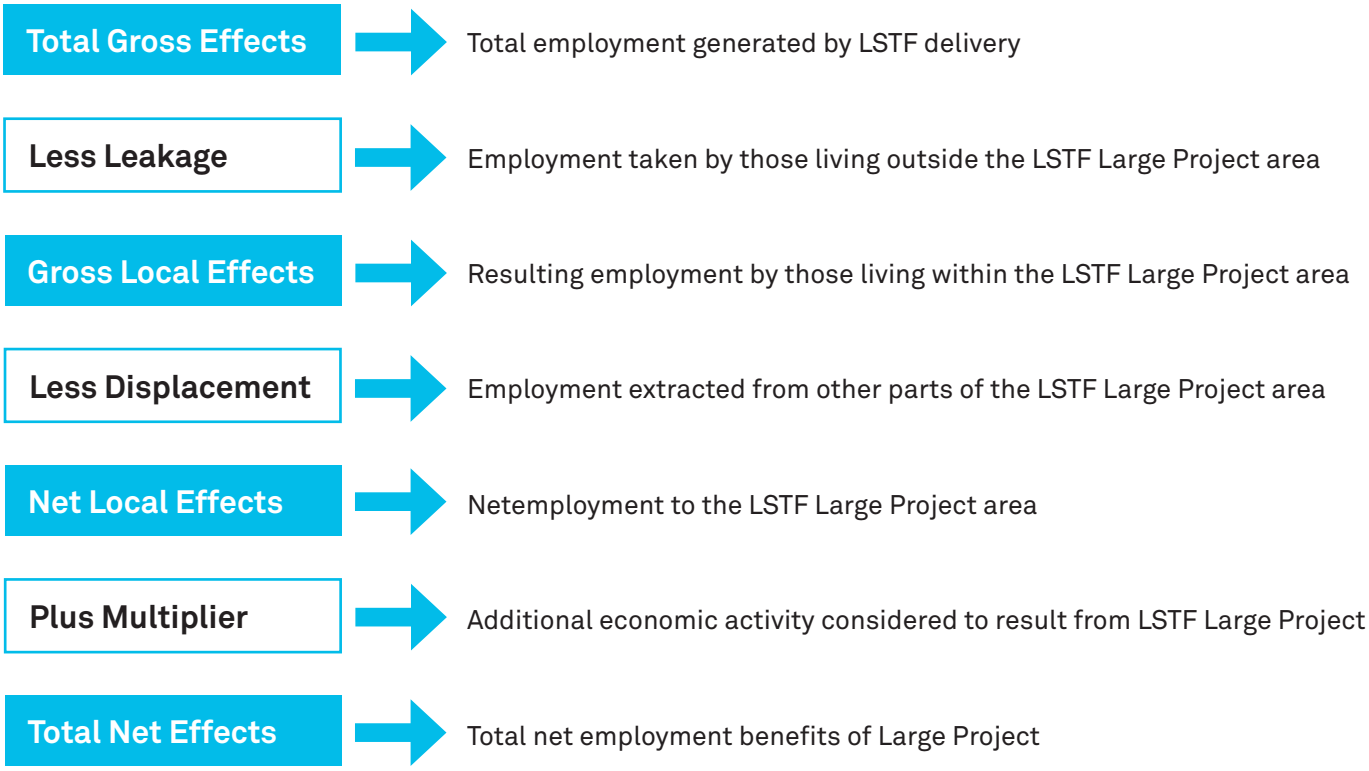


Table 4.4: Assumptions for Calculating Net Employment Effects[21]

Net Factors	Definition	Assumption Levels
Leakage	The proportion of outcomes that would benefit those outside the LSTF programme area.	- Construction Sector – 30% - Professional Services Sector – 50%
Deadweight	The level of outcomes that would have occurred anyway, in the absence of LSTF.	- Construction Sector – 30% - Professional Services Sector – 50%
Displacement	The proportion of the outcomes that are accounted for by a reduction in outcomes elsewhere in the LSTF area.	- Construction Sector – 20% - Professional Services Sector – 0%
Multiplier	The further economic activities (jobs, expenditure and income) associated with additional local income and supplier purchases.	- 1.2 to be adopted for all sectors.

[21] Source: The majority of factors presented have been derived from English Partnerships Additionality Guide, 2004, and are based on primary research in the construction and services sectors

The net employment effects can then be converted into Gross Value Added (GVA) to provide an estimate of the economic benefits (income or productivity) generated. This is achieved using employment sector GVA/productivity factors as calculated by the Office of National Statistics (Table 4.5); employment data collected by PTEs and LTAs should also be classified into sectors, to support accurate assessments of additionality. Productivity factors are available at the local authority level, and PTEs and LTAs should use the lower geographical level possible to enhance the accuracy of the assessment. The availability of GVA data at the local authority and employment sector levels would also support a corridor specific GVA per workforce job estimate to be made, based on the composition of jobs (by sector) in each corridor. As the GVA per workforce job statistics are based on the Full Time Equivalent (FTEs), information on the split of full and part time staff would need to be obtained from which an estimate of FTEs will be made.

Table 4.5: ONS Productivity Factors by Sector (Source: ONS NUTS 1.1 Headline Workplace GVA)

GVA per head (£)											
United Kingdom	IGAH	14 677	15 353	16 135	17 044	17 896	18 538	19 538	20 525	21 103	20 357
North East	IGAI	11 135	11 689	12 269	13 009	13 693	14 203	14 913	15 603	15 945	15 621
North West	IGAJ	12 585	13 196	13 819	14 526	15 164	15 594	16 317	17 155	17 604	17 263
Yorkshire and The Humber	IGAK	12 465	13 066	13 724	14 455	15 064	15 401	16 051	16 828	17 149	16 569
East Midlands	IGAL	12 831	13 493	14 177	15 016	15 722	16 131	16 839	17 629	17 914	17 349
West Midlands	IGAM	12 951	13 520	14 082	14 739	15 331	15 668	16 313	17 049	17 335	16 788
East of England	IGLI	13 412	14 077	14 805	15 735	16 690	17 292	18 245	19 152	19 375	18 591
London	IGLJ	22 932	23 885	25 389	27 060	28 607	29 753	31 645	33 772	35 100	34 200
South East	IGLK	15 414	16 277	17 113	18 075	18 955	19 509	20 427	21 327	21 681	20 923
South West	IGAQ	13 149	13 848	14 572	15 434	16 213	16 682	17 491	18 289	18 682	18 211
England	IGAR	14 685	15 409	16 223	17 160	18 020	18 589	19 539	20 558	21 049	20 442
Wales	IGAS	11 032	11 565	12 115	12 735	13 247	13 723	14 323	14 966	15 222	14 842
Scotland	IGAT	13 467	14 045	14 837	15 735	16 506	17 241	18 298	19 403	20 031	19 744
Northern Ireland	IGAU	11 417	11 936	12 493	13 203	14 052	14 556	15 281	16 026	16 240	15 795
United Kingdom *less* Extra-Regio[5]	IGAV	14 306	15 004	15 796	16 708	17 544	18 121	19 057	20 057	20 541	19 977
		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009[4]

Finally, the deadweight or counterfactual should be estimated i.e. the outcomes that would have occurred in the absence of the LSTF Large Project. This will be difficult to estimate give the complex nature and wide geographical scope of Large Projects, and the extensive use of assumptions is likely to be required. These should again be agreed with local and national stakeholders (including the Department for Transport). The assessment of direct employment from the delivery of LSTF measures can be undertaken at a range of geographical levels, depending on the defined data specifications.

In the event that the direct observation and recording of employment is not considered feasible, an alternative approach would be to calculate the employment numbers derived from the overall investment in LSTF i.e. the reverse of the above approach. This is achieved by dividing the total expenditure on project activity (inclusive of DfT and match funding expenditure) by output per worker factors as shown in Table 4.5. Such an assessment of employment generated by LSTF projects should consider and be aware of the following issues:

- The economic sector(s) selected to represent the range of LSTF activities;
- The time period for the assessment, as bulletins prepared by ONS are adjusted for seasonal influences; and
- The economic sectors K to S within the ONS statistics are at present based on experimental analysis and are not considered appropriate for designation as National Statistics. Appropriate caveats should be assigned to data using such factors.

The level of additionality must again be determined by first undertaking a gross-to-net calculation and secondly comparing this with the counterfactual position.

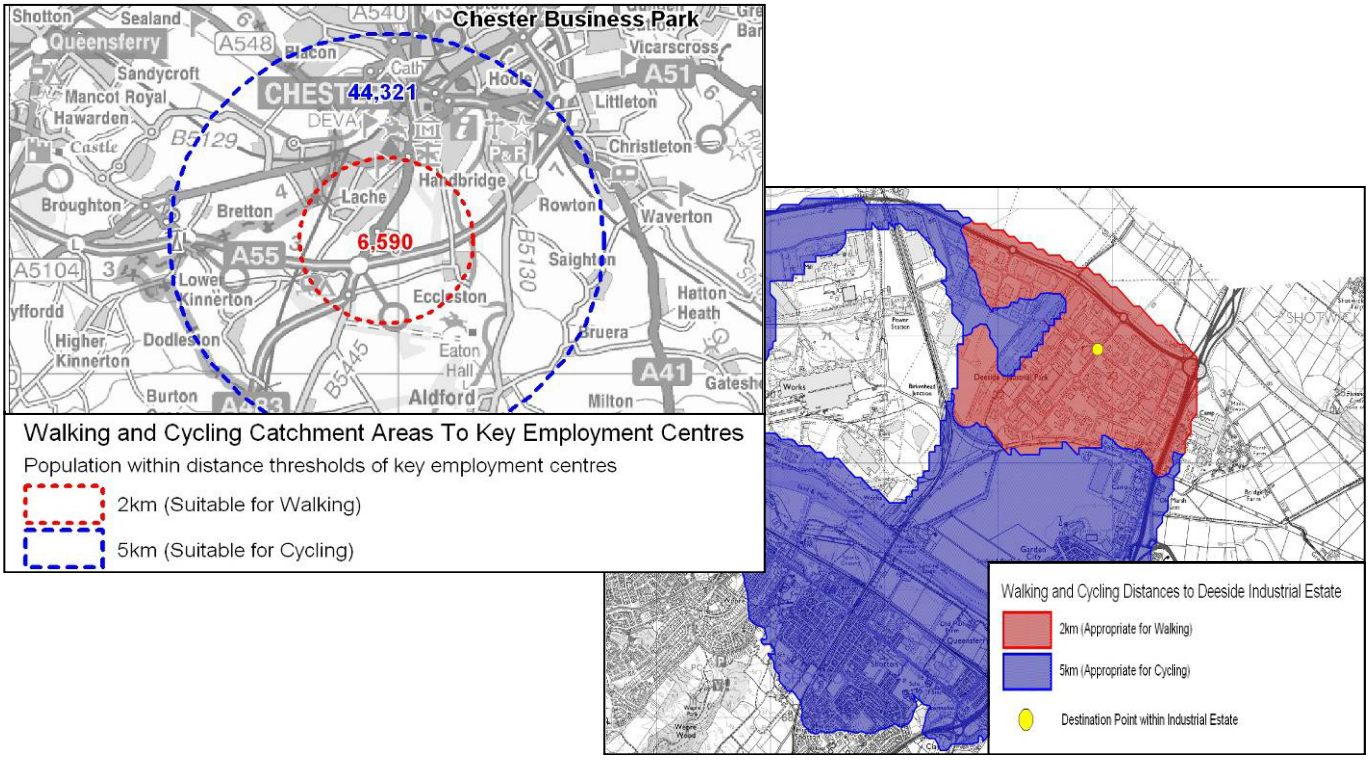
4.3.2 Accessibility to Workforce and Employment

The second measure of direct economic benefit is the level of accessibility to employment opportunities, which can be undertaken at both the site and Large Project levels. For site-based assessments (business park or town centre) PTEs and LTAs should continue to adopt the Local Transport Plan and DfT methodology of assessing accessibility using the Accession software. This will provide an estimate of the labour force catchment area within defined travel times to sites by different modes.

The analysis should be undertaken for the Lower Super Output Area (LSOA) in which an employment site or area resides. The quantitative analysis of accessibility should also be combined with qualitative research with employers in the defined area, to consider the impacts of LSTF on the ability of employers to fill posts (see Section 4.5 for further guidance on undertaking such research). This is important to ensure that the assessment considers changes in access to employment and the subsequent take-up of employment opportunities. In addition, Accession can be used to determine the accessibility from specific neighbourhoods (such as economically deprived communities) of employment locations i.e. the reverse of the above approach.

However, this assessment should only be made where the LSTF Large Projects are making direct improvements to the physical infrastructure or accessibility arrangements to selected sites or areas. Modelling such as Accession will not identify small changes in accessibility, even at the corridor or area level. Despite this, Accession modelling can provide a useful tool to demonstrate changes in accessibility to employment, using an industry recognised tool and data that is readily available (the population data is commonly derived from the Census). Examples of monitoring the number of people (of employment age) within defined travel times of business parks are provided in Figures 4.3.

Figure 4.3: Accessibility Assessment Walking and Cycling Catchment to Business Parks



Another area of direct monitoring should be for schemes to support individuals receiving jobseekers allowance through enhanced access to training and employment eg. Workwise. Delivery agencies should be required to report on the numbers of beneficiaries, segmented into sub-groups by socio-economic characteristics, and outcomes measured against overall LSTF objectives, including:

- The number of people employed in delivering the scheme (as outlined in Section 4.3.1);
- The number of unemployed people accessing training through the scheme;
- The number of unemployed people accessing interviews through the scheme;
- The number of unemployed people accessing work through the scheme; and
- The number of unemployed people remaining in work after 4 weeks.

Information should be gathered systematically from individuals at key stages of engagement including initial support, 4 and 13 weeks post employment. Qualitative data (eg. client and JobCentre Plus feedback) should again be used to substantiate quantitative reports in understanding the extent to which schemes assist in overcoming transport barriers to employment. It is important that appropriate data protocols be established between all parties to ensure that individual information is protected. Personal information should never be disclosed inappropriately and any evaluation of initiatives should be reported anonymously, broken down by gender, age, postcode, ethnicity and travel mode.

Checklist –Direct Economic Benfits		Section
✓	Have appropriate input data specifications been included within Service Level Agreements?	4.3.1
✓	Has the range of direct LSTF delivery employment been defined?	4.3.1
✓	What factors/assumptions are to be used in estimating leakage and displacement?	4.3.1
✓	Are substantive changes in accessibility proposed within the Large Project?	4.3.2
✓	Are business related costs within scope and is data available?	4.3.3

4.3.3 Business Related Costs

The final area of direct economic benefit will be realised by the individual workplaces and businesses benefiting from enhanced transport accessibility and changes in employee behaviour. For example, an increase in the willingness and experience of employees of using public transport and non-motorised modes for commuting and other trip purposes could lead to changes in travel choices for business-related travel i.e. trips undertaken as part of the working day. This could result in reductions in travel expenses incurred. The training of drivers undertaking delivery or transport activities could also reduce fuel consumption, emission rates, road traffic accidents and associated business costs. The data required to monitor such changes would need to be provided by individual businesses and therefore the format and comparability of data across LSTF Large Project areas may be different. LSTF delivery teams therefore need to define:

- The business related impacts of LSTF investment and the anticipated level of change, through which to determine the value for money of undertaking monitoring activities;
- Those businesses to be monitored, including the selection of a sample of representative organisations to reduce the resource burden and costs;
- Businesses selection should be representative in terms of size, location, sector and business-related travel undertaken; and
- The selection of businesses not experiencing LSTF investment as a control group.

The monitoring of such costs has been included herein for completeness. However, given the level of anticipated change and the range of confounding factors (new company travel policies outside of LSTF programmes) this should only be adopted to supplement other monitoring and evaluation and where cost data is readily available.

4.4 Decongestion Benefits of LSTF

The highway decongestion benefits should be considered by LSTF Large Project teams where significant traffic reductions are considered likely to occur in moderate to congested situations. The decongestion impacts of LSTF Large Projects could include reductions in peak period traffic flows and associated reductions in junction delays (congestion), reduced car-based mileage, reduced journey times (and enhanced reliability) and potentially reductions in road traffic accidents. Monitoring and evaluating such changes can be undertaken at the Large Project or corridor levels, using a range of data inputs and analysis techniques. This guidance focuses on two approaches; first at the project level the updating of ex-ante appraisal analyses using outturn monitoring data; and secondly the use of TrafficMaster data to assess changes in corridor network efficiency.

4.4.1 Updating Appraisal Economic Forecasts

The first approach is re-running of existing modelling tools (highway models, public transport models etc) using observed outturn data, as a means of calculating estimates of outturn economic benefits. There is extensive guidance on the ex-ante economic appraisal of transport investment through the DfTs WebTAG units[22], which remain valid for undertaking an updating exercise. The use of appraisal techniques and modelling platforms, alongside outturn data, to forecast economic impacts has been the subject of extensive research during the 1990's and early 2000's (See Box 4.2). The evaluation should identify clearly the changes in two stages: first that are due to changes in national parameters such as GDP or traffic forecasts; and secondly those resulting from the LSTF investment.

Any approach to update ex-ante appraisal forecasts as part of an LSTF assessment should reflect the scale of investment and the specific coverage and focus of the initial appraisal activities. The post-delivery assessment should therefore repeat, as closely as possible, the focus of the ex-ante appraisal, including the coverage of quantitative assessment and those indicators where more qualitative assessments were undertaken. This could include a range of factors as outlined in the DfTs guidance[23]:

'In line with Treasury's appraisal requirements, the impacts considered are not limited to those directly impacting on the measured economy, nor to those which can be monetised. The economic, environmental, social and distributional impacts of a proposal are all examined, using qualitative, quantitative and monetised information. In assessing value for money, all of these are consolidated to determine the extent to which a proposal's benefits outweigh its costs.'

An initial task should therefore be the review of those appraisal objectives and sub-objectives that were considered important during the preparation of the business case, those that were forecast to have a large impact and those that were discounted as secondary in terms of their anticipated change. Given the number (24) and range of objectives that form a standard Appraisal Summary Table[24], the anticipated direction and magnitude of change associated with each, a full ex-post assessment could be extremely expensive. A key decision as to whether to adopt a modelling-based methodology will be the extent of the objectives and metrics to be analysed. However, in defining the scope, PTEs and LTAs should consider the importance of accommodating for the possibility of specific factors having a significantly larger outturn impact than forecast; repeating ex-ante data collection may not identify such changes.

Box 4.2: Case Study - Highways Agency Post Opening Project Evaluation

The Highways Agency POPE[25] approach for evaluating major infrastructure investment represents a recognised and tested methodology, which focuses on identifying:

- Overall transport economic efficiency, incorporating changes in the value for money of the scheme, improved transport efficiency for businesses, transport providers and users;
- Improved journey time reliability; and
- Wider economics benefits.

The outturn monitoring data requirements of POPE include traffic flows, journey times, traffic speeds and accidents levels, to which monetised values are applied. For the assessment of wider economic impacts the present POPE methodology recommends a desk based study combined with consultation with development stakeholders, reflecting the costs associated with using modelling tools to estimate multiple economic factors.

[22] http://www.dft.gov.uk/webtag/

[23] The Transport Business Case: Economic Case, DfT, 2011.

[24] http://www.dft.gov.uk/webtag/documents/project-manager/unit2.7.2.php

[25] http://www.dft.gov.uk/webtag/documents/project-manager/unit2.7.2.php WebTAG Unit 3.8 Wider Impacts and Regeneration, 2009.

PTEs and LTAs should also determine whether full variable demand modelling should be repeated, where this formed the approach for the ex-ante appraisal. A more complex and comprehensive modelling approach will require more extensive data collection, validation and analysis. Similarly, if a Land Use Transport Interaction (LUTI) model was used during the appraisal process, this could be updated alongside highway and public transport modelling platforms to consider the movement between employment productivity levels[26]. The associated data and processing costs should again be considered fully.

The data collection requirements will reflect the scope of ex-post modelling, which will be bespoke to each LSTF Large Project. Data collection specifications must again reflect those undertaken to validate the ex-ante appraisal modelling. The minimum recommended approach would consist of five core elements (Table 4.6). It is also important to recognise that because each LSTF Large Project is unique the data collection and precise modelling activities will be bespoke to each area, and so the provision of generic guidance is not possible.

Table 4.6: Modelling Approach to Updating Appraisal Forecasts

Stage	Required Activities
Re-basing of transport do-minimum models to provide more accurate comparative base for ex-post assessment	- Updating baseline model to account for changes in background factors. This includes GDP and NRTF Values of Time that are updated regularly by the government.
Collection of outturn data	- Traffic flows - Journey times - Traffic accidents data - Public transport patronage data
Updating Large Project costs	- Covering all elements of investment accommodated within the ex-ante appraisal assessments
Updating of forecast model (do-something) using outturn data	- Change model network to reflect infrastructure changes - Validate model using outturn data
Run model outputs to determine benefits	- Use TUBA to assess vehicle operating costs and journey time economic (dis) benefits - Use COBA to assess accident related economic (dis)benefits - Identify changes in other objectives (noise, air quality) and determine (dis) benefits

[26] WebTAG Unit 3.8 Wider Impacts and Regeneration, 2009.

The interpretation and presentation of outturn results must also be undertaken with due care and diligence, to manage resource inputs and expenditure. For example, should the outturn impacts be different to those forecast then a decision will be required as to first, the importance of determining why, and secondly the resources to be expended in such explorations. The experience of the Highways Agency in adopting POPE and the assessment of outturn impacts highlights the challenges and risks inherent in the process. For example, the level of outturn traffic abstraction may be commensurate with forecasts, but could be due to wider changes in land use patterns rather than the investment in the highways network. Controlling for such factors will be particularly pertinent for the assessment of LSTF Large Projects, given the distribution of investment across local authority areas accommodating diverse characteristics and interventions.

A benefit of developing an updated and validated ex-post modelling platform would be the ability to assess the potential impacts on the wider area labour market supply. Using inputs such as the total commuting costs and times between defined origin and destination zones, the added value to the economy generated by LSTF investment could be determined by[27]:

- Calculating how commuting costs change as a result of the scheme and how this will affect the benefit an individual obtains from working;
- Calculating how the change in the benefit from working will impact on the overall amount of labour supplied; and
- Calculating the additional national output produced by the new labour supplied.

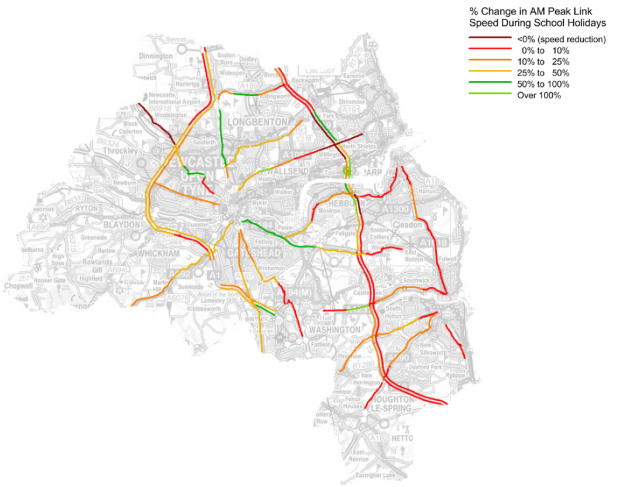
The timing of ex-post appraisal updates should also reflect the nature and scale of anticipated change. Good practice dictates that for larger projects, this should include a one year after-implementation snapshot assessment, followed by a five year post delivery full assessment reflecting the amount of time taken for behavioural patterns to 'settle down' following a large project intervention.

4.4.2 Corridor Based Assessment

TrafficMaster GPS data can be used to calculate data outcomes for selected sections of the highway network, including link based traffic flows (of those vehicles with GPS units), travel times (in seconds), link lengths, and journey times (reported in seconds per mile). The percentage change in journey times across all main corridors should be calculated using before and after datasets; it should be noted that this methodology would use two independent datasets and that no link can be made between individual vehicles within each dataset. The data is provided to local authorities by the DfT and therefore the central costs for its use would be related to the processing and analysis. The data can be analysed at the corridor or network levels although careful analysis frameworks are required to handle the large quantity of data.

An example of the comparative analysis possible using TrafficMaster data is shown in Figure 4.3, which presents the differences in link speeds between a school term-time and a non term-time period.

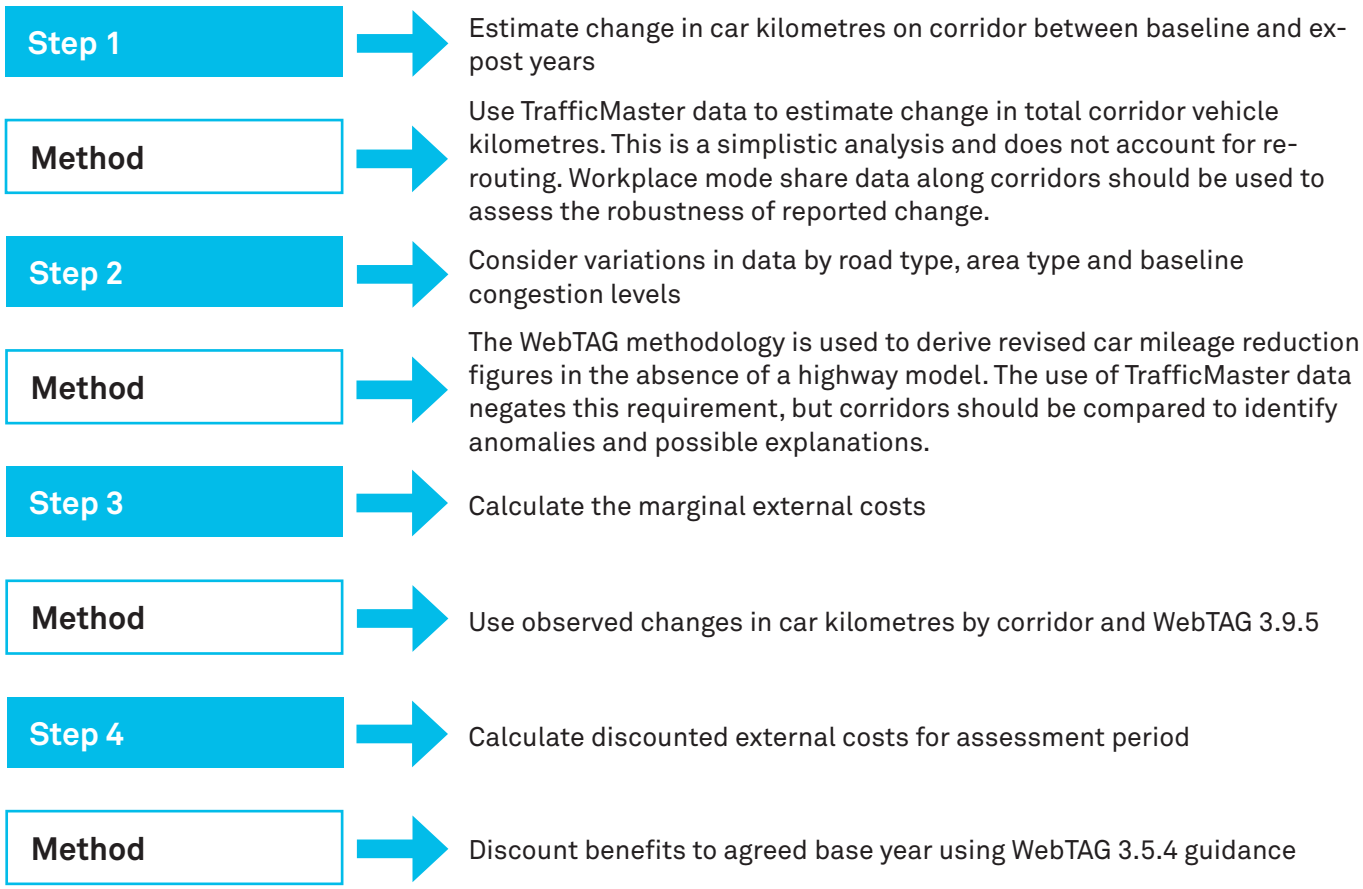
Figure 4.3: Journey Speed Difference (2011 AM Peak) (Source: Tyne and Wesr Key Component Monitoring Framework)



[27] WebTAG Unit 3.5.14 The Wider Impacts Sub-Objective, 2009

Once the traffic and journey time changes have been calculated, WebTAG Unit 3.9.5[28] should be used to generate the associated decongestion benefits. The decongestion benefits are calculated by establishing a value of the journey time savings and other costs and externalities due to the removal of a vehicle kilometre from a road network following four steps (Figure 4.5).

Figure 4.5 Stages of Calculating Decongestion Benefits



[28] WebTAG Unit 3.9.5 MSA Major Scheme Appraisal Road Decongestion Benefits

The analysis approach outlined above includes a number of fundamental assumptions relating to the scope and robustness of data, which should be articulated clearly by PTEs and LTAs when reporting outturn results. Central to this is the assumption that the TrafficMaster dataset will be representative of the overall corridor or area traffic movements, and that changes in one will reflect the wider changes on the network. Other risks to be considered include:

- Traditional traffic flow and speed monitoring should be undertaken to validate data or appropriate caveats made;
- The processed dataset can be large and requires specific tools to enhance analysis;
- Data is provided as link averages and require normalisation for corridor-level reporting; and
- Consideration needs to be given to the presentation of data (GIS is a common application).

However, this approach does represent a relatively inexpensive approach to estimating the economic benefits of decongestion.

Checklist –Decongestion Benefits		Section
✓	Is the re-running of appraisal modelling platforms within scope of the available budget?	4.4.1
✓	Is full variable demand and land use modelling to be undertaken?	4.4.1
✓	Are the data collection specifications robust to provide data to input into modelling platforms?	44.4.1
✓	Has the do-minimum model been re-based and the do-something forecast model been updated using outturn data?	4.4.1
✓	Is a corridor based assessment of decongestion required?	4.4.2
✓	Is data available for the areas of assessment?	4.4.2

4.5 The Wider Economic Impacts of LSTF

The third approach and area of assessment considers the wider economic income and productivity impacts of LSTF. As outlined in Section 4.3 a well-accepted mechanism for assessing GVA impacts uses data on employment created or safeguarded[29] during the period of the LSTF programme, and the subsequent determination of the extent to which such employment can be directly attributed to LSTF. The difference is that this assessment considers all employment rather than just that required to actually deliver the LSTF programmes. This section presents the recommended monitoring and evaluation approach and data requirements, alongside the timing of evaluation activities.

4.5.1 Monitoring and Evaluation Approach

The assessment of economic impacts should be monitored in the baseline and ex-post periods through a combination of quantitative data collection and qualitative research with local business and stakeholders. Good practice demonstrates that this should include (Box 4.3 presents a case study where a combination of the following techniques was adopted[30]):

Box 4.3: Case Study - Manchester Metrolink Business Impact Study

AECOM were commissioned by Transport for Greater Manchester to undertake a baseline, interim and ex-post evaluation of four extensions to the Manchester Metrolink. The following table presents a summary of the data collection methodologies, frequencies and scope for assessing the business impacts. The evaluation design included the use of other parts of Greater Manchester (excluding the Regional Centre) as comparison areas for the four corridors under assessment.

Data Source	Timing	Sample	Monitoring Coverage
Quantitative surveys with local businesses	- Baseline - Year 1 - Year 3	- 100 businesses per area or corridor[31] - Split into large (250+), medium (50-249), small (10-49) and micro (1-9) categories	- Number of employees - Number of employees by sector - Annual turnover - Profitability - Economic expectations
Qualitative research with sub-sample of businesses	- Baseline - Year 3	- 10 businesses per corridor - Public and private sector - Large organisations	- Perceptions of business conditions, transport links - Challenges for employees travel
Qualitative interviews with stakeholders	- Baseline - Year 3	- 20 interviews - Local authorities - Commercial property agents	- Labour availability - Labour market skills - Timescales for impacts
Collation of secondary data	- 5 year baseline trends - Baseline - Year 3	- N/A	- Corridor level analysis of the Business Register Employment Survey (BRES)[32] - Business profiling by sector - Cluster analysis by sector - Location quotient analysis - VAT registrations (business density, turnover, re-registration rates) at local authority level only

[29] Department for Business Innovation and Skills, 2009, RDA Evaluation: Practical Guidance on Implementing the Impact Evaluation Framework

[30] It should be noted that this case study used a bespoke selection of research methodologies and does not represent a 'model of deliver' that could be transferred to other locations. Consideration should be given to the specific requirements of local LSTF projects and the scope of economic monitoring and evaluation.

[31] A sample of 100 organisations will provide a confidence interval of +/- 9.8% at the 95% confidence limit, for a response given by 50% of the population. An increase to 200 organisations would generate a confidence interval of +/- 6.9%.

[32] http://www.ons.gov.uk/ons/rel/bus-register/business-register-employment-survey.html

assessment is not considered feasible using this approach. Logic mapping can again be used to help prioritise evaluation requirements and target data collection. An exemplar logic map has been prepared for the South Yorkshire Business and Employment Sustainability Toolbox (BEST) package of investment (see Figure A5), showing the potential scope of evaluation across the three areas of economic assessment; direct employment, decongestion and wider impacts. The use of colour coding can also assist in differentiating between anticipated impact areas and thereby data requirements. The links in Figure A5 have been added to demonstrate the impacts leading into wider economic benefits.

The use of comparison areas/corridors as part of an economic evaluation is a potentially complex and resource intensive activity. As outlined in Section 2.3.3 (experimental design) a range of factors and variables must be considered in selecting areas, with data collection requirements matching those defined for the intervention area. For the purposes of evaluating wider economic impacts, comparison areas should be analysed using secondary datasets (BRES, NBD) to understand within-Large Project variations. Large Project or PTE level comparisons with ONS defined comparison towns can also provide context to outturn analyses, without extensive data collection.

Careful consideration needs to be given to the survey methodology adopted in collecting the above data, so as to establish a sustainable and acceptable balance between the costs and quality of data collected. Given the potentially large geographical coverage of business interviews, depending on the specific evaluation design being adopted, telephone interviews should be considered as these can be more cost effective than face-to-face interviews; costs for recruiting panel members by telephone and undertaking an initial 20 minute interview range from £20 - £30 per member, compared to £40 - £50 for face to face[33]. Face to face approaches are also prone to inflated costs due to businesses cancelling interviews. A panel approach is also recommended for surveying local businesses to assist with the management of response attrition during the course of the LSTF programme; ongoing engagement and communication aids response rates and data quality. PTEs and LTAs should also review the outputs from each survey at the baseline to consider any revisions required and to assess the relative roles of each dataset. For example, should a low response rate be achieved for the quantitative surveys, consideration should be given to approaches to boost response rates and to alternative sources of data.

The National Business Database (NBD) should be used to extract the business sample[34], and an assumed response rate of 30% should be used when collating a population of target businesses. Secondary data on the total number of employees at a corridor/area level can also be obtained from the Business Register and Employment Survey (BRES), to complement the collation of data from businesses. Data should be weighted (grossed up) by stratification variables, such as business sector, in each corridor/area to provide total employment figures (again using NBD/BRES data).

In the ex-post surveys, information on the number of employees at the target corridor/area should be obtained and businesses asked to estimate how different the number of jobs at the site/area would have been in the absence of LSTF investment to aid in defining the counterfactual. The baseline survey weighting exercise should be repeated on the ex-post data and comparisons made to quantify employment change and contributing factors. All data should be cross-checked with employment-related multiplier effects from increased turnover. The identification of the net employment changes attributable to LSTF Large Projects would enable a calculation of GVA uplift - per worker ratios (available at local authority level) to derive estimated changes in GVA. Impacts at the corridor/area level can be estimated by factoring the results (based on the survey data) using secondary data relating to the number of employees (BRES).

Information on business turnover may be challenging to obtain from quantitative surveys, and where non-responses occur the reasons for this should be recorded to assist with weighting/banding in subsequent analyses. An estimate of business turnover is also available from the NDB, but this will not be as accurate as data collected from businesses

[33] It is also noteworthy that a cost saving of £5 per interviewee can be achieved using telephone based panel for repeat surveys, whilst no cost saving is generally achieved using face to face techniques.
[34] National Business Database is managed by Experian and is an amalgamation of Companies House, Thompson Local Directory and the Yellow Pages Directory, and includes data on employee numbers and the age of businesses.

directly. The assessment of attribution of observed changes in business turnover should be undertaken using evidence from all available surveys, and through the use of secondary information for any comparison areas selected. Consideration should again be given to multiplier effects (eg. jobs) that result from increased turnover.

4.5.2 Strategic Added Value (SAV)

Another measure of economic outcome that could be assessed is the Strategic Added Value (SAV), which seeks to determine the wider coordination, catalytic and influence of investment[35]. The assessment would reflect the whole contribution of the Large Project and assesses the impact of investment on strategy-making, awareness raising and the promotion of best practice. Whilst there is no standard method for evaluating SAV, it remains an important aspect of evaluating the impact of LSTF investment; it is particularly important in terms of demonstrating how investment has influenced activity that might not otherwise have occurred.

Work undertaken for the Department of Business Innovation and Skills (DBIS) and previously the Department of Trade and Industry identified a number of measures which can be used in the assessment of SAV. Examples of the types of measures that would be relevant to the assessment of SAV for LSTF Large Projects are shown in Table 4.7. Data should be collected through the aforementioned business surveys, and to provide a clear representation of the assessment it is recommended that each indicator be scored at a 1-5 scale; the average score of the indicators would determine an overall score for each of the three measures. The scoring of the indicators should again be supported by supplementary qualitative evidence. This approach has been used in previous assessments of SAV referred to in the Department for Business Innovation and Skills guidance.

Table 4.7: indicators of Strategic Added Value

Measure	Indicator
Strategic/catalytic activity	Has the project.... 1) ...led to additional investment and interest from the private sector (and public sector)? 2) ...been successfully integrated into land use planning, development frameworks and masterplans? 3) ...contributed to addressing socio-economic issues, including levels of worklessness?
Increasing co-ordination and implementation	Has the project.... 1) ...improved the co-ordination, networking and working relationships between stakeholders? 2) ...built up the capacity of stakeholders? 3) ...generated or contributed to partnerships, which contribute towards growth of the local economy?
Leverage and influencing/ awareness raising	Has the project.... 1) ...contributed to the leverage of funding and other resources from stakeholders in support of regeneration activities? 2) ...enhanced the perception and awareness of the area as a location to inves t?

[35] Department for Business Innovation and Skills, 2009, RDA Evaluation: Practical Guidance on Implementing the Impact Evaluation Framework

4.5.3 Assessing Additionality

The ex-post surveys should be used to estimate new staff numbers and where they have come from (i.e. have any additional jobs been created at the site/area, or have they been transferred from other locations within the Large Project area). Questions should also cover topics including transference of jobs, location of competitors and main markets. Data from the surveys should therefore be used to inform the selection of displacement and leakage factors by corridor/area to identify the local net impacts. Questions relating to attribution and the counterfactual should also be included within the business surveys, and considered in association with contextual (secondary) data, to identify the net additional impacts.

A number of source documents provide 'ready reckoners' to support PTEs and LTAs in undertaking such assessments, such as those for the assessment of employment leakage (Table 4.8)[36]. Similar tables are available for displacement, deadweight, substitution and multiplier factors[37] and should be applied to LSTF evaluations. Because of the unique nature of each LSTF Large Project and the characteristics of the local environment in which they will be delivered, it is not possible to provide specific recommendations as to levels of adjustment to be applied. All available data, both qualitative and quantitative, should be used to first determine an appropriate level, and secondly to provide robust justification for the levels selected.

Table 4.8: Factors for the Assessment of Leakage

Level	Description	Leakage
None	All benefits go to the people living in the target area/group	0%
Low	The majority of benefits go to people living in the target area/group	10%
Medium	A reasonably high level of benefits will not be retained within the target group/area	25%
High	Many of the benefits will go to people living outside the target group	50%
Very High	A substantial proportion of those benefiting will live outside the target area/ group	75%
Total	None of the benefits will go to members of the target area/group	100%

[36] Additionality Guide Third Edition, English Partnerships, 2008 (p20 Table 4.2).
[37] Additionality and Economic Impact Assessment Guidance Note, Scottish Enterprise, 2008. The standards applied in this guide have been derived through research and the review of outturn impacts across economic sectors.

4.5.4 The Timing of Economic Evaluation

It is recommended that the macro-economic impacts of LSTF Large Projects should be evaluated in line with good practice adopted in macro-economic evaluations of urban regeneration programmes. This would necessitate three stages of assessment (Table 4.9). Two challenges are evident within these guidelines: first, the requirement as in all datasets for a robust baseline to be collected before significant LSTF delivery; and secondly, the requirement to collect data between one and three years after the LSTF Large Project has been delivered. PTEs and LTAs should establish an agreed monitoring and evaluation programme and ensure that sufficient and sustainable resources are available to delivery ex-ante and ex-post survey activities.

Table 4.9: Stages of Evaluation

Evaluate Stage	Timing	Scope of Activities

Appraisal (ex-ante)	- Before the LSTF programme is implemented
	- During business case and programme development activities
		- Assessment of forecast changes in key metrics, including:
		  - Traffic flows
		  - Journey times

Interim Evaluation	- Following year 1 delivery of LSTF interventions.	- Review of monitoring data - Strategic assessment of fit with evaluation purpose and rationale - Review of outputs achieved - Review of immediate benefits (direction and magnitude)
Impact Evaluation (ex-post)	- 1-3 years post the completion of LSTF delivery.	- Full assessment of additionality - Analysis of changes in outcomes - Stakeholder consultation and exploration

Checklist – Wider Economic Impacts		Section
✓	Has an appropriate, proportionate and robust approach been developed that fully meets the requirements and scope of LSTF assessment?	4.5.1
✓	Have appropriate comparison areas been identified and is data available?	4.5.1
✓	Are local business subject to other ongoing research or investment that may influence the travel behaviour of staff?	4.5.1
✓	Is the Strategic Added Value being assessed as well as Gross Value Added?	4.5.2
✓	Have appropriate factors been derived to support the assessment of additionality?	4.5.3
✓	Have the timescales for data collection and assessment been agreed?	4.5.4

05

Assessing Carbon Impacts

5.1 Introduction

As one of the DfT's core LSTF objectives, carbon reduction is a fundamental aspect of all the LSTF projects. Each of the LSTF projects have carbon emission targets set at the programme level, that have been calculated using modelling and appraisal tools (such as TUBA[38] or PITHEM[39]). Table 5.1 illustrates the wide ranging scope of these carbon reduction targets[40].

While these targets have been set at the programme level, it is anticipated that monitoring and evaluation will be focused on measuring and assessing the outcomes of individual interventions or packages rather than producing programme level data that can validate these overarching targets. Furthermore, the carbon reduction targets have in some cases been set at timescales well beyond the scope of the LSTF monitoring and evaluation period of 3 years.

In order to address this issue, the methodologies for monitoring and evaluation have been split into two parts. First, by considering the expected carbon benefits (or dis-benefits) over the period of funding and the lifecycle of the project, and secondly, to address the scope and boundary of emissions to prevent carbon leakage. Although generally considered as the international shifting of emissions, Carbon Leakage in this context would include the shifting of emissions from one corridor to another without an overall net reduction in emissions within the boundary (e.g. changes to one road displaces traffic to another route).

Table 5.1 LSTF Carbon Reduction Targets

LSTF project	Carbon reduction target
Nottingham Urban Area LSTF Main Bid	- 10% reduction in carbon from 'transport' over 3 years.
BIG HERTS BIG IDEAS	- 18,209 tonnes over a 30 year period.
A Better Connected South Hampshire: Supporting Growth, Reducing Carbon, Improving Health	- Total reduction in carbon emissions of 26,000 tonnes.
Transport for Greater Manchester: Let's Get to Work	- 1,000 tonnes of carbon a year.
Surrey Travel SMART	- 22,000,000 tonnes of carbon
South East Dorset Sustainable Travel Package – "The 3 Towns Corridor"	- 40,938 tonnes of carbon over a 60 year period.

[38] More information on the Transport User Benefit Appraisal can be found here: http://www.dft.gov.uk/topics/appraisal-evaluation/tools/tuba/
[39] The Platform for Integrated Traffic, Health and Emission Modelling takes the outputs from the transport models to generate estimated emissions of CO_2. It is currently being used to model emissions from Tyne and Wear's 'Transport Planning Model'.
[40] These targets have been taken from the LSTF Large Project bid documents.

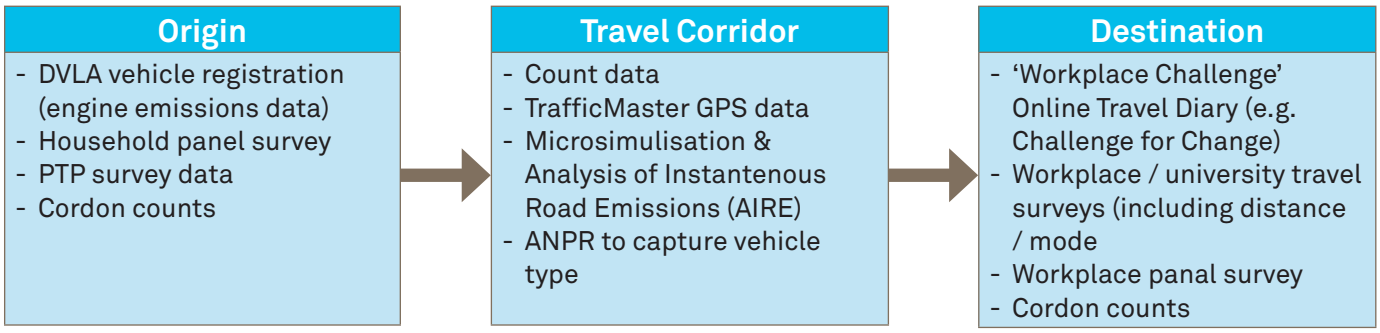
5.2 Monitoring the Carbon Impacts of LSTF

Due consideration should be given the provision of carbon reduction over time, particularly in relation to the first three years of the LSTF project. The carbon reduction target should not simply be divided by the number of project years, as this is likely to overestimate the reductions at the start and underestimate those near to the end of the project. In establishing the potential reductions over the lifecycle of LSTF, it is important to set the boundaries of the carbon measured. These boundaries should explicitly state which emissions are in and out of scope of the monitoring.

The scope of what is being monitored and evaluated should be defined at the outset to decide which interventions and geographical areas should be prioritised for assessment (see Chapter 2). This will have an impact on the most appropriate methodology and geographical point to measure carbon impacts (i.e. at trip origins, destinations or along a travel corridor). In cases where interventions are anticipated to measurably reduce carbon emissions along a corridor, then corridor-based measurements may be appropriate. For example, an enhanced public transport offer may be expected to reduce car numbers and therefore overall journey times along key travel corridors; the benefits of which can be estimated using the DfT's Basic Carbon Tool which uses inputs such as speed, vehicle numbers and distance travelled[41].

The journey time and traffic flow outputs of TrafficMaster can also be used to calculate carbon emissions[42]. However, these tools may be less useful if the public transport improvements involve replacing car lanes with bus lanes, which by reducing road capacity, would have an adverse effect on car journey times.

In other cases, there may be no anticipated measurable impact on a travel corridor, for example promotional activities at workplaces all over a study area (e.g. WEST's 'Jam Busting Challenge'[43] aimed at encouraging workplaces to compete with each other to save the most carbon over a four week period). In these situations it would be better to focus data collection at the target group at the origin or destination of their journeys (e.g. specific workplaces or residential areas). Similarly some measures would have no impact on congestion at all, such as the replacement of Internal Combustion Engine (ICE) public transport vehicles and cars with Ultra-low Emissions Vehicles (ULEVs).



[41] More information on the Basic Carbon Tool can be found here: http://www.dft.gov.uk/publications/local-authority-basic-carbon-tool/
[42] Using average CO_2 emissions of 0.33kg per car mile (source: Defra, 2011 Guidelines to Defra / DECC's GHG Conversion Factors for Company Reporting: Methodology Paper for Emission Factors, August 2011)
[43] More information can be found here: www.jambusting.com

5.3 Considering Carbon Leakage and Shifting

The sustainability of carbon reduction is a key issue for the LSTF projects, particularly when considering the long timescales attached to the LSTF project carbon targets; which extend many years beyond the life of the project. This reflects the nature of LSTF interventions that are designed to achieve long-term behaviour changes within target populations.

In order to ensure that intention for carbon reduction is translated into actual carbon reduction, it is important to consider the emissions that might arise beyond the boundary of measurement as a direct consequence of changes undertaken as part of the LSTF programme. An example of this would be the use of Ultra-Low Emissions Vehicles. Within the boundary of measurement, the impacts are a likely shift from an internal combustion engine to an electric vehicle which may result in a significant carbon saving. This would need to be offset against any recharging infrastructure within the boundary of measurement and the emissions from electricity generation beyond the boundary of measurement; this would still provide a net decrease in emissions, but demonstrates the need to consider the wider impacts of measures to reduce carbon.

A further example might be the allocation of a single lane to buses, which may encourage a partial modal shift from the car along the corridor, with some displacement of cars to alternative routes. This displacement of emissions should be included as part of a net emissions reduction.

Carbon shifting is a more complex element to measure and conceive. This tends to relate to the personal choices an individual might make as a direct result of the benefits of a change. This might include the use of increased disposable income generated from use of more sustainable modes resulting in a rebound effect that leads the individual to consume or purchase unsustainable goods or services. While the LSTF delivery teams may choose to consider this as beyond the scope of monitoring and evaluation, it would be useful to include as part of any surveying work that may be employed. An example of carbon shifting might be the mode shift from car to bicycle - this will likely result in a cost saving to the individual that might then be spent on more regular international holidays.

5.4 The use of Surveys in Determining Carbon Reductions

Surveys can be a useful tool in determining and quantifying emissions reduction. For example the WEST LSTF project specifically targets students arriving at university and residents at new developments, to take advantage of the opportunity presented to change behaviours before new travel habits are formed. The temporary provision of smart cards to allow free travel on public transport as part of schemes to connect people to employment opportunities is another example, where it is anticipated that recipients will continue to travel on PT after period that an incentive has been provided.

Monitoring should be focused at these targeted individuals, with travel surveys to gather baseline data about their target travel behaviours (e.g. journeys to work and university) as well as wider behaviours (e.g. car ownership) and test assumptions about the initial impact of the intervention and the longer term sustainability, which will require a survey several months after the intervention.

There will be interventions specifically targeted at reducing carbon emissions that are either new or innovative and where the knowledge base is limited (e.g. smart ticketing or ULEVs). These provide opportunities for developing a knowledge production based monitoring and evaluation approach. For example, a number the LSTF projects contain interventions to support and promote ULEVs as shown in Table 5.2. These vehicles produce low or zero tailpipe carbon emissions, compared to convention Internal Combustion Engine (ICE) cars[44].

[44] Although there are carbon emissions associated with the generation of the electricity that electric vehicles use, which varies depending on the power generation method (e.g. fossil fuels, renewable energy or nuclear).

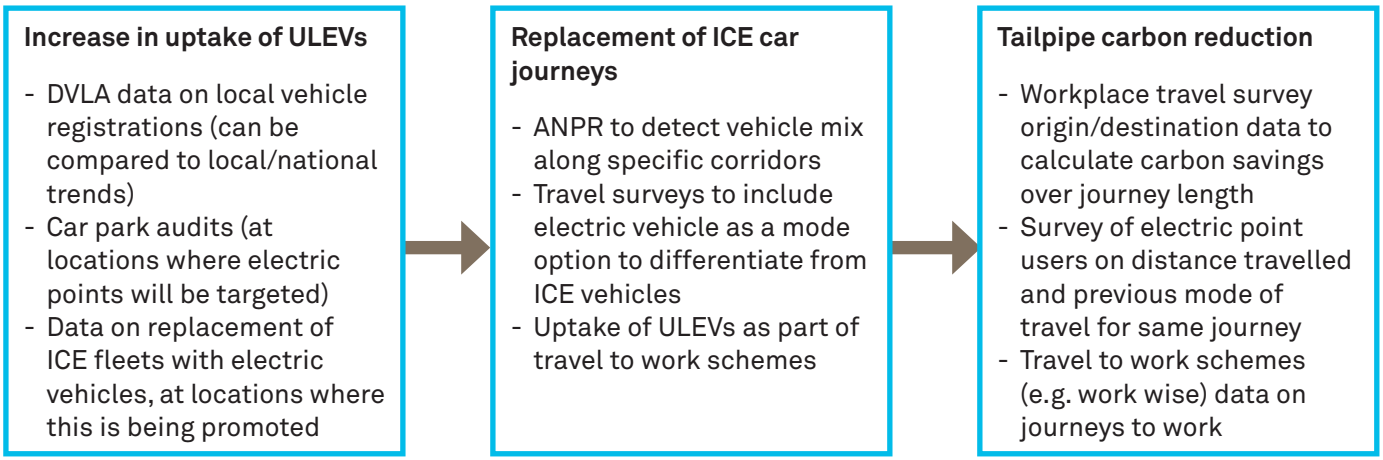
Table 5.2 ULEV in LSTF Projects

LSTF project	Description
South East Dorset Sustainable Travel Package – "The 3 Towns Corridor"	- Electric charging points at 10 locations including the town centre, supermarkets and at car parks.
West of England Sustainable Transport	- Provision of electric and low carbon vehicle for business travel.
BIG HERTS BIG IDEAS	- Electric scooters for access to jobs and charging points.
Nottingham Urban Area LSTF Main Bid	- Electric scooters for access to work. - Supporting PT and fleets to switch to electric and low carbon vehicles.
South Yorkshire: A Sustainable Journey to Work	- Promotion activities associated with electric vehicle use.
Surrey Travel SMART	- Promotion activities associated with electric vehicle use.

The next stage of developing a monitoring and evaluation framework is to establish the project objectives and anticipated benefits. In the case of ULEVs, the LSTF interventions are focused around encouraging their uptake through a combination of infrastructure support (e.g. electric charging points), ULEV loans and promotional activities designed to encourage individuals, PT and fleets to switch from ICE vehicles. The longer-term aims are that adoption of electric vehicles will increase and that this will lead to a decrease in tailpipe carbon emissions on local road networks.

Realistically, the anticipated benefits will be small and concentrated in specific areas where there is electric vehicle infrastructure and where the use of electric vehicles is being actively promoted. Depending on what research questions are selected; monitoring data collection should be focused at specific locations where these interventions are being targeted (e.g. the car parks where electric car charging points have been installed). Examples of data collection opportunities are illustrated by Figure 5.1 and have been focused at picking up changes at the point of delivery and the specific locations that the ULEVs have been targeted.

Figure 5.1: Opportunities to monitor ULEVs



5.5 Conclusions

To summarise, the monitoring and evaluation of carbon emissions should be focused around specific interventions, with careful consideration given to the anticipated *measurable* benefits and the *time* they are expected to occur. These can be used to develop relevant monitoring metrics. The same consideration applies to the measurement of other more immediate outcomes that directly feed into carbon calculations (e.g. mode share, distance travelled and journey data) so it is anticipated that the measurement of carbon will be focused on the same interventions selected for monitoring and evaluation of other outcomes as part of an holistic monitoring and evaluation approach.

Checklist – Measuring Carbon Impacts (Section 5.2)	
✓	Has the geographical scope and specific interventions been selected for monitoring and evaluation?
✓	Have the anticipated benefits from selected interventions been identified?
✓	Has the precise focus of monitoring been defined (i.e. accountability / knowledge production)?
✓	Have the precise monitoring locations been identified (e.g. origin, destination and / or corridor)?
✓	Is the sustainability of interventions being assessed?

06

Assessing Secondary Impacts

6.1 Introduction

The LSTF Large and Small Projects are targeting a range of secondary objectives covering health, safety, accessibility and social wellbeing. This Chapter presents high level guidance on the monitoring options for such issues, highlighting the resource requirements and recommendations for proportionate data collection. The guidance is presented in less detail than that for economic and carbon assessments, which reflects their relative prominence within LSTF projects and the likely priority afforded them in the allocation of available monitoring funding. Signposting to existing guidance and recent relevant research is provided, to highlight good practice. Each objective is addressed with the following information provided:

- A brief overview of the potential impacts of LSTF on the objective; and
- The options for monitoring and assessing impacts.

6.2 Evaluating Health and Physical Activity

6.2.1 Impacts of LSTF on Health and Physical Activity

There is strong evidence of the health benefits of cycling and walking as forms of physical activity. The current Government advice is to achieve a minimum of 30 minutes moderate activity on at least five days of the week[45], with brisk walking and cycling included within the definition of 'moderate activity'. Recent research has also identified that only 40% of men and 28% of women meet these recommendations in adults[46] demonstrating the significant scope to change people's behaviour. Substituting car-based trips with walking and cycling have therefore been identified as among the easiest and most accessible actions to incorporate into everyday life among a range of behavioural change options[47].

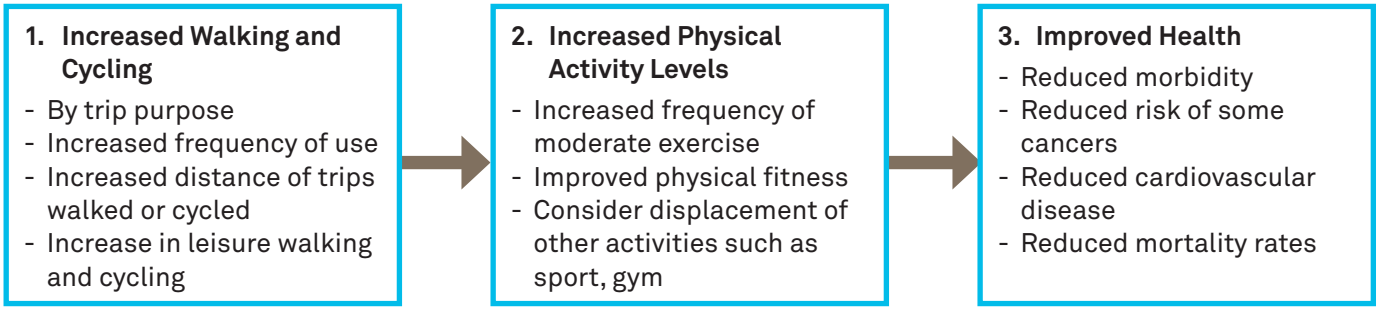
Given this national context, a number of LSTF Large Projects are targeting investment to improve the health and physical activity of local populations, with a range of potential benefits including:

- Improving social equality through healthier lifestyles;
- Improving the health of the working age population;
- Reducing absenteeism at workplaces; and
- Improving the economic activity rates of socio-economically deprived communities.

To monitor changes in health and physical activity PTEs and LTAs must first identify the mechanisms of change that are being targeted which may vary between population sub-groups. This commonly has centred on the promotion of active travel (walking and cycling) targeted at children, young people and families; delivered at schools, leisure centres and through community and health activities. Active modes are also being promoted as part of wider investment packages targeted at commuters, with delivery focused at business sites as well as residential areas.

It is also important that PTEs and LTAs consider the point in the pathway to improved health at which data is to be collected, recognising the advantages and disadvantages of conducting analysis at each point. Figure 6.1 presents a simplified logic map of the stages to improving first physical and secondly wider health standards. The monitoring and evaluation options at each stage are presented below.

Figure 6.1 Logic Map of Physical Activity and Health Pathway



[45] http://www.healthandtransportgroup.co.uk/articles/makingcase_health_transport.pdf
[46] http://www.sustrans.org.uk/what-we-do/active-travel/active-travel-information-resources/physical-activity-and-health-facts-and-figures
[47] Valuing the benefits of cycling – a report to Cycling England, May 2007

6.2.2 Monitoring Changes in Walking and Cycling

The first measurement of change is that in the level of walking and cycling among local target populations. PTEs and LTAs can use walking and cycling monitoring data collected across a number of locations and LSTF interventions to estimate changes in the use of active modes (see Appendices B and C for methodologies in collecting walking and cycling monitoring data). For example, data being collected to monitor changes in mode share at business parks or employment sites can also provide an indication of increased walking and cycling for commuter trips. A similar approach can be adopted for schools and other trip purposes with data collected at either trip origin/destination points or en-route (Table 6.1).

The central weakness of destination based data is that it will only be for a single trip purpose, and the data will be limited to the period of baseline and ex-post monitoring. The use of cycle count data along cycle routes can provide the most continuous measure of change, but no data on trip purpose or destination is collected. It should be recognised that a number of assumptions would be required to use such monitoring data to determine estimates of physical activity, and subsequently health benefits. Such assumptions would include:

- What is the level of replacement of other physical activities i.e. sport, gym or gardening;
- What is the frequency of walking and cycling;
- What is the distance and duration of walking and cycling activities; and
- Who is increasing walking and cycling activity levels.

Alternatively, PTEs and LTAs can use data from a baseline and ex-post household panel survey to identify changes in the frequency of walking and cycling. As noted in Section 3.4.2 a household panel can provide data to address a range of indicators, as well as providing the platform to undertake targeted qualitative research. Fewer assumptions are required using such data as questions can cover more than a single trip and so changes in walking and cycling across all purposes can be identified. A travel diary can also be issued to a sub-sample of household panel respondents, collecting data on all trips undertaken including purpose, mode and distance. This data can support a more accurate estimate of physical activity for the chosen sub-sample and good practice dictates that a 7-day diary is adopted for the following reasons:

- A 7-day travel diary period is long enough to cover major and short term variations in travel behaviour particularly between weekdays and weekends. Journeys made for different purposes (work, shopping, leisure) and more occasional trips of interest (such as walk, cycle trips on weekends) are more likely to be identified than with a shorter diary period;

Table 6.1: Monitoring Data Sources

Data Location	Data Collection Method	Changes in Walking and Cycling
Origin (household)	Household survey, travel diary	Demonstrates changes in walking and cycling, but questionable as to whether it can show a link between this and changes in physical activity.
Destination (workplaces, schools, etc)	Hands-up survey, workplace travel survey, cycling counts undertaken by a Bike It officer, bicycle parking count	
Corridor (en route)	Automatic cycle counts, pedestrian counts (see Appendices B and C)	

- Government guidance is to carry out 30mins or more activity 5 times a week, and this lends itself to a 7-day travel diary to help establish how far people are adopting active travel behaviour on a weekly basis;
- Within a 1-3 day diary it can be difficult to ensure that trips recorded are typical of those made on other days. A 7-day diary addresses this difficulty and generates a larger sample of trips per household;
- A 7-day diary can be cost effective because a smaller sample is needed overall to achieve the same precision as a diary using a shorter time frame; and
- The costs for a 7-day diary will be similar to those with a shorter diary period.

However, such datasets would not provide a direct measure of the changes in physical activity, but would provide an indication of the direction of change. The use of a travel diary can also substantially increase the costs of data coding and entry, and the full costs should be considered before finalising survey designs.

6.2.3 Monitoring Changes in Physical Activity

The second option is the direct monitoring of changes in physical activity levels among target groups. This is likely to require additional data collection activities and survey tools designed specifically for the purpose and PTEs and LTAs should consider the resource implications before committing to undertake such surveys. If the assessment of changes in physical activity is a core objective and requirement of monitoring activities it is recommended that additional questions be incorporated into any existing household panel surveys. Such questions can be drawn from existing and tested survey tools, such as the EPIC survey[48] (Table 6.2), which support the assessment of changes in all physical activities, thereby accounting for replacement issues. Where a household panel survey is not part of a PTEs and LTAs monitoring plan it is not recommended that a separate survey be undertaken to monitor physical activity due to the likely expenditure required.

Table 6.2: Example Question from EPIC Survey

In a typical week during the past 12 months, how many hours did you spend on each of the following activities?		
	IN WINTER HOURS PER WEEK	IN SUMMER HOURS PER WEEK
Walking, including walking to work, shopping and leisure		
Cycling, including cycling to work and during leisure time		
Gardening		
Housework such as cleaning, washing, cooking, childcare		
Do-it-yourself		
Other physical exercise such as keep fit, aerobics, swimming, jogging and playing sport		

[48] European Prospective Investigation into Cancer (EPIC) Physical Activity Index

6.2.4 Monitoring Changes in Health

The LSTF programme provides an opportunity to enhance the existing knowledge base of the health impacts of transport interventions; for example an application has been made to the National Institute for Health Research for funding to consider such factors. The outputs of such research should be shared across the PTEs and LTAs as part of the LSTF programme to support the assessment of estimated health benefits. However, the routine investment of LSTF programme funding into monitoring the health impacts resulting from changes in physical activity is not recommended as it can be prohibitively expensive and will require an extensive experimental evaluation design.

6.3 Road User Safety

6.3.1 Impacts of LSTF on Road User Safety

Britain's roads are among the safest in the world but improved road user safety continues to be a key Government target. Although the majority of local authorities in England have seen reductions in casualty numbers over the last decade, challenges remain in addressing prevailing safety issues. These include higher cycling casualty levels in 2009 compared to 2008 (a 5% increase was reported[49]). Indeed, pedestrians and cyclists have a higher fatality rate per distance travelled than for any other mode of transport except motorcyclists[50]. Cyclists and pedestrians remain particularly vulnerable road users and safety perceptions and attitudes are often the reported reason why people do not cycle. This highlights the need to monitor both the level of accidents and casualties, and changes in the perceived safety, on local road networks.

6.3.2 Monitoring Changes in Safety

Data on road traffic accidents are collected routinely by the Police in all PTEs and LTAs and are available through the STATS19 database. STATS19 provides detailed data regarding the characteristics of accidents, the severity of casualties (killed, seriously injured and slight injuries) and the age of casualties (permitting child/adult comparisons). This permits the analysis of casualty rates (by category) per head of population and also by length of road network.

The unintended impacts of LSTF investment on road safety also need to be monitored to provide a comprehensive assessment of impacts. For example, promoting walking and cycling and increasing their modal share will create more vulnerable road users and could increase road traffic accidents involving such people, particularly inexperienced cyclists. Mapping the intervention logic can assist PTEs and LTAs in considering potential unintended impacts and identify relevant datasets. The targeting of LSTF Large Projects on deprived communities should also be accompanied by the routine monitoring of road casualties to provide data on intended and unintended impacts of Large Projects (see Box 6.1).

Box 6.1: Case Study – Road User Safety in Deprived Communities

Despite an overall decline in the number of road traffic related deaths and injuries in recent years, people from deprived areas are at higher risk than those from more affluent areas[51]. The risk of injury as a pedestrian in deprived areas is approximately eight times those in the most affluent areas. In particular, young pedestrians have the strongest relationships between deprivation and injury risk. This higher risk is not because of the number or nature of trips undertaken ('exposure'), but factors associated with deprivation such as:

- Living in more hazardous environments;
- Living in areas with high levels of hazardous and illegal driving behaviour;
- Having lifestyles with higher level of exposure to environmental risk;
- No access to safe spaces and supervised facilities;
- Limited levels of understanding regarding the risks; and
- Poor access to information about facilities and services.

[49] Road Safety Statistics Great Britain, 2010. DfT
[50] National Audit Office DfT Improving road safety for pedestrians and cyclists in Great Britain (2009).
[51] Road User Safety and Disadvantage, DfT June 2008

6.4 Accessibility to Employment and Services

6.4.1 Impacts LSTF will have on Accessibility

The potential impact of LSTF Projects on accessibility to employment has already been highlighted in Section 4.3. The LSTF programme will also influence wider societal accessibility issues such as the affordability of transport options, the quality of transport options and the connectivity of the transport network.

The LSTF Large Projects also contain common aims to improve access to the following key areas:

- Services: doctors, hospitals etc;
- Workplaces: training and employment;
- Retail: central and suburban; and
- Education for those leaving secondary school.

A key objective for some of the PTEs and LTAs is to improve accessibility by sustainable modes linking people in deprived communities to jobs and facilities. LSTF investment is therefore aiming to benefit those with no access to private transport, through the provision of enhanced public transport services. Examples of the types interventions proposed by the PTE Large Projects include:

- The enhancement of bus and rail interchanges;
- The distribution of smartcard travel offers for 16-19 year olds;
- Scooter loan/purchase scheme (including electric scooters);
- Community Transport and Social Enterprise Initiatives, to provide community-led bus services. This is to improve access to key economic sites for bus routes that are not currently commercially viable;
- Additional early morning and late evening services to access to industrial sites; and,
- A network of readily accessible cycles at local centres, employment hubs and transport interchanges through provision of cycle pool and hire schemes, including folding bicycles at stations.

6.4.2 Monitoring Changes in Accessibility

There are a number of methodologies available through which PTEs and LTAs can monitor changes in accessibility. Accession modelling can be used to monitor changes in accessibility for physical changes to infrastructure. For example, improvements in public transport services such as additional services in the morning and evening peaks or, new public transport routes and Community Transport and Social Enterprise initiatives. However, although Accession modelling can detect and monitor accessibility to demand responsive services such as a community transport initiative, it can assume a bigger advantage than is realistic. For example, the model assumes that all of those in a certain area previously restricted by limited public transport services are all now able to access the community transport. Realistically, this transport service is likely to have limited capacity, i.e. a mini bus and so only a certain percentage of the defined area would have access to this service. Any accessibility assessment of community or demand responsive transport should therefore be combined with the analysis of patronage data and evidence of any unmet demand.

Another limitation of accession modelling is that it does not provide data on whether there has been an increase in the number of people actually using new public transport connections to access employment and services. As above, the monitoring of physical changes can be combined with the monitoring of service users and beneficiaries. Employer surveys can be undertaken in defined targeted areas, such as a business park, to assess whether employers have been able to fill posts more easily following enhanced transport connectivity. Chapter Four has provided further guidance on both of these approaches.

Monitoring changes in accessibility to services such as retail centres will be challenging for PTES, and should only be undertaken where investment has been targeted specifically to address such issues. The first activity should be to undertake an audit of

targeted retail centres to identify the actual change in accessibility, using one of the methodologies outlined in Section 3.3. Secondly, the change in people actually benefiting from improved accessibility should be assessed, using changes in footfall at a retail centre. However, to ensure that changes in the data can be attributed to LSTF investment it would be necessary to undertake on-street interviews to ascertain respondent origin, mode of travel and frequency of retail us. The monitoring and assessment of accessibility should be undertaken before and immediately after investment is delivered, so that the auditing processes can identify the physical changes in provision. It is also recommended that a one year post delivery survey and audit be undertaken to consider the drop-off in perceptions and behaviour over time.

6.5 Social Wellbeing

6.5.1 Impacts of LSTF on Social Wellbeing

Social wellbeing is a complex issue touching on elements of wealth, health and personal safety. Improved wellbeing can be achieved through the promotion of healthy lifestyles, creating safe and inclusive living environments and delivering communities whose levels of access to services and facilities are good. As already outlined in this Chapter, LSTF Large Projects are targeting many of these areas.

6.5.2 Monitoring Changes in Social Wellbeing

The WebTAG Unit 3.17[52] provides detailed guidance on measuring the social and distributional impacts of transport interventions. These include children, older people, disabled people, Black and Minority Ethnic (BME) communities, people without access to a car and people on low incomes. This guidance highlights that not all impacts of a scheme/intervention are felt the same by all groups of people.

It is not recommended that additional data be collected by PTEs and LTAs purely to consider social wellbeing. However PTEs and LTAs could undertake a high level qualitative assessment following the guidance outlined in WebTAG 3.17. The eight impacts areas defined by WebTAG and how these impacts may arise are presented in Table 6.4 to assist PTEs and LTAs in designing/collating data to consider changes in social wellbeing.

[52] WebTAG Unit 3.17 Detailed Guidance on Social and Distributional Impacts of Transport Interventions, 2011.

Table 6.4: WebTAG Guidance on Social and Distributional Impacts

Impact	Potential for Social and Distributional Impacts	Issues
User Benefits	Most of the time transport interventions produce user benefits. However, through these benefits some people may experience disbenefits such as longer journey times or reduced public transport frequencies.	If those experiencing the disbenefits are in vulnerable social groups, this would be an adverse social impact. These need to be considered alongside the aggregate benefits of the transport intervention.
Noise	Interventions that increase traffic levels, speeds or reduced physical gaps between people and traffic will result in noise impacts.	Children are especially affected by noise levels.
Air Quality	Any intervention that increases traffic levels, increases the amount of slow-moving traffic or reduced physical gaps between people and traffic will possibly result in an impact on air quality.	Risk to health due to poor air quality. Where people live will influence the level of pollutants to which they are exposed.
Accidents	Interventions that increase traffic levels, speeds or reduced physical gaps between people and traffic can result in increased accidents.	No significant accident risk should be introduced, in particular to children, older people and people living in areas of deprivation.
Security	Some interventions will give rise to perceived or real security risks that affect transport choices.	Potential security issues can be identified early and designs could be amended. Where this is not possible, the scale and significance of impacts should be assessed for each vulnerable group.
Severance	This typically affects those without access to a car, children, older people and people with disabilities	Can be identified at an early stage and design amended. Where this is not possible, the scale and significance of impacts should be established for each vulnerable group
Accessibility	Transport interventions will have differential impacts on accessibility depending on the group of people. This reflects a range of social and distributional factors, including different travel needs and places of residence.	Can be identified at an early stage and design amended. Where this is not possible, the scale and significance of impacts should be established for each vulnerable group.
Personal Affordability	May have direct financial costs borne by users of the transport intervention, e.g. parking charges or public transport fares. This will be felt more severely by young people and low-income households.	Alternative travel options may be possible. However, lower income groups will often face disproportionate increases in transport costs relative to incomes.

Checklist – Secondary Impacts		Section
✓	Are interventions expected to influence physical activity levels among target populations?	6.2.1
✓	At which stage of logic chain will monitoring data be collected?	6.2.1
✓	Is existing LTP road safety analysis sufficient for the LSTF assessment and if not have appropriate alternative methodologies been defined?	6.3.1
✓	Are there any anticipated impacts on accessibility through the LSTF project?	6.4.1
✓	How are changes in accessibility going to be monitored and presented?	6.4.2
✓	Which elements of social wellbeing are to be assessed as part of the LSTF project?	6.5.1

07

Technical Appendices

Technical Appendix A – Exemplar Logic Mapping

To support PTEs and LTAs in developing bespoke logic mapping for their individual LSTF Large Projects, the following examples of mapping are provided:

- **A1: Economic impacts of LSTF investment at a business park**, for a hypothetical case study in the Tyne and Wear region.
- **A2: Input monitoring sub-model for business park investment.**
- **A3: Outcome monitoring sub-model for business park investment.**
- **A4: The Business and Employment Sustainability Toolbox in South Yorkshire**, demonstrating the ability to show three different types/categories of economic impact for a single package of investment.

It is recommended that following terminology is adopted when constructing logic mapping:

- **Context:** the background investment other than the LSTF programme, including wider economic and social changes.
- **Inputs:** the investment and resources that have been made, including capital and revenue spend, human resources and equipment.
- **Outputs:** what has been delivered in terms of interventions, but also the reach achieved within target populations.
- **Outcomes:** the changes in behaviour and travel patterns that can be observed, split into three levels:
  - First order: the immediate such in indicators such as traffic flows and modal split;
  - Second order: such as changes in physical activity and reductions in peak period congestion; and
  - Third order: the longer term changes in productivity, absenteeism and employment.
- **Impacts:** should be considered to be the same as third order outcomes.

Figure A1: Business Park Logic Mapping

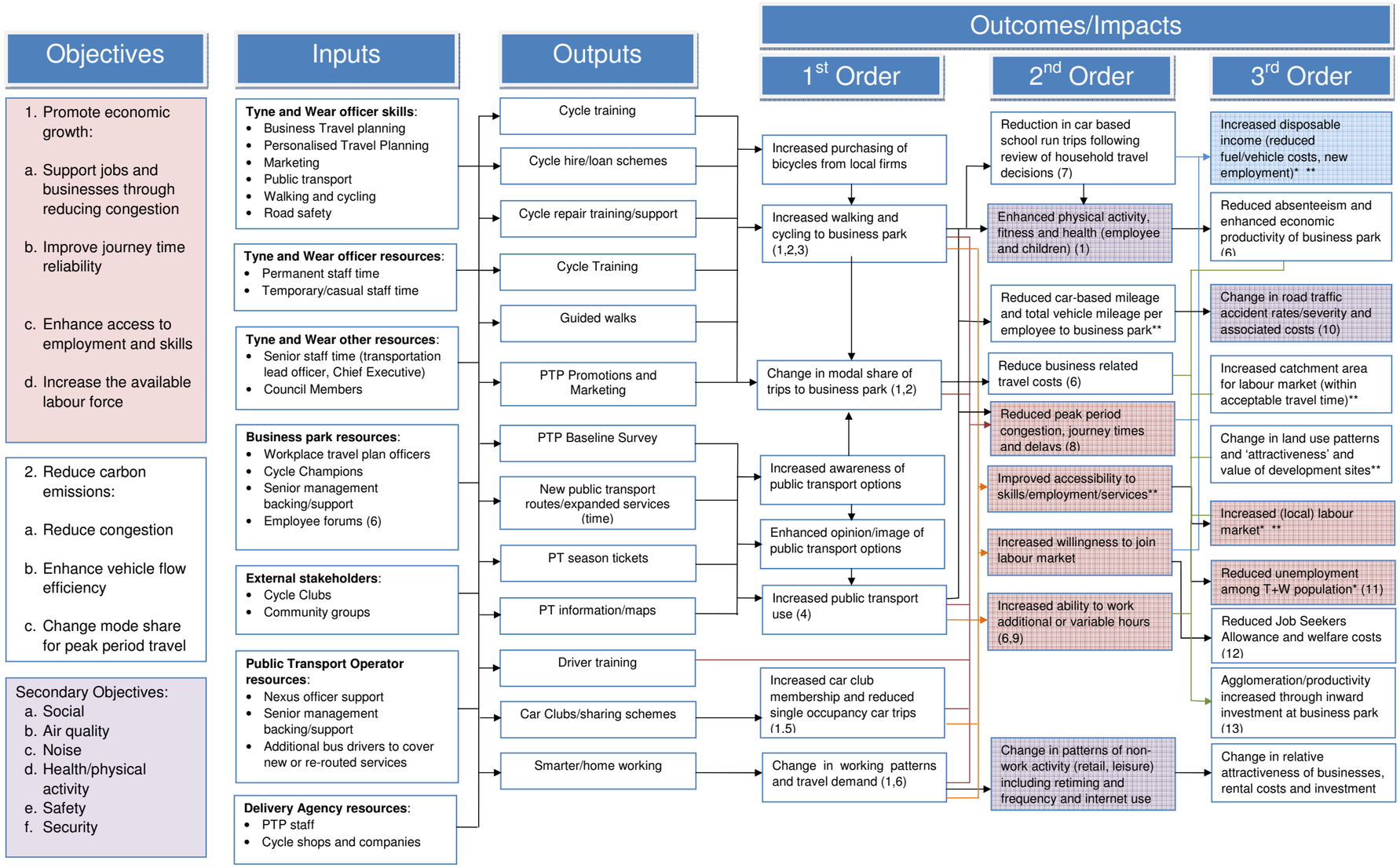


Figure A2: Business Park Inputs Sub-Model

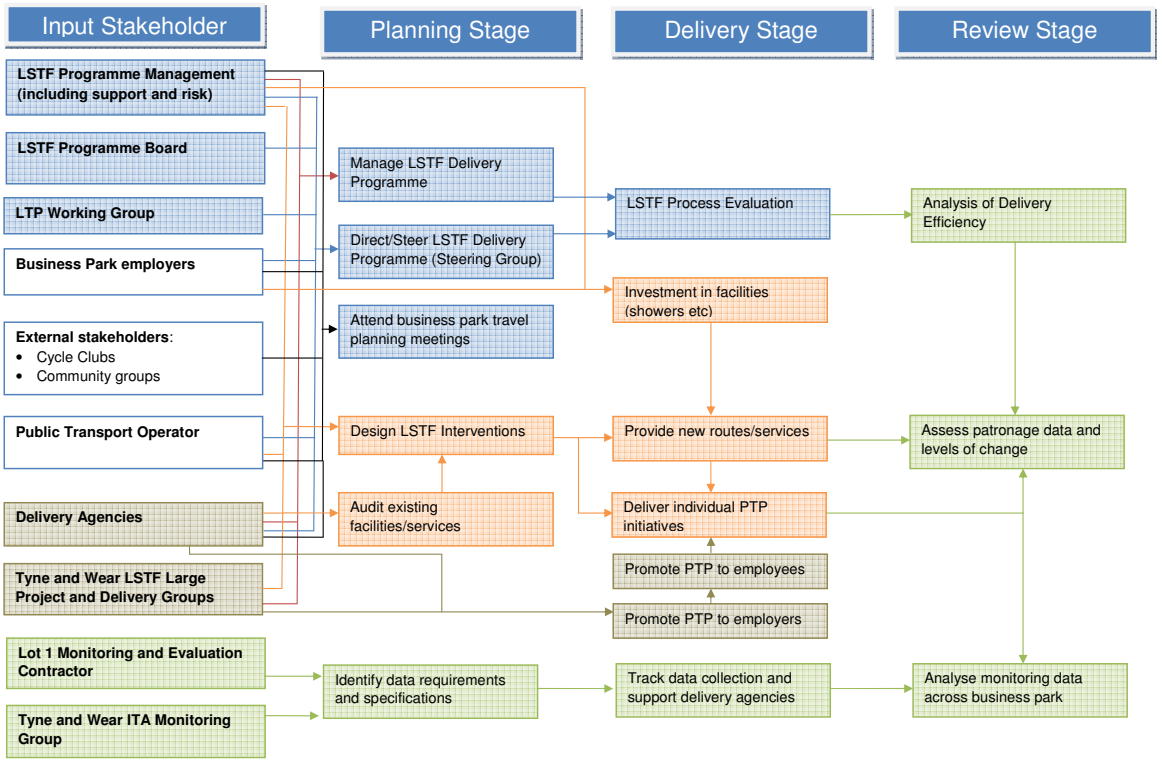
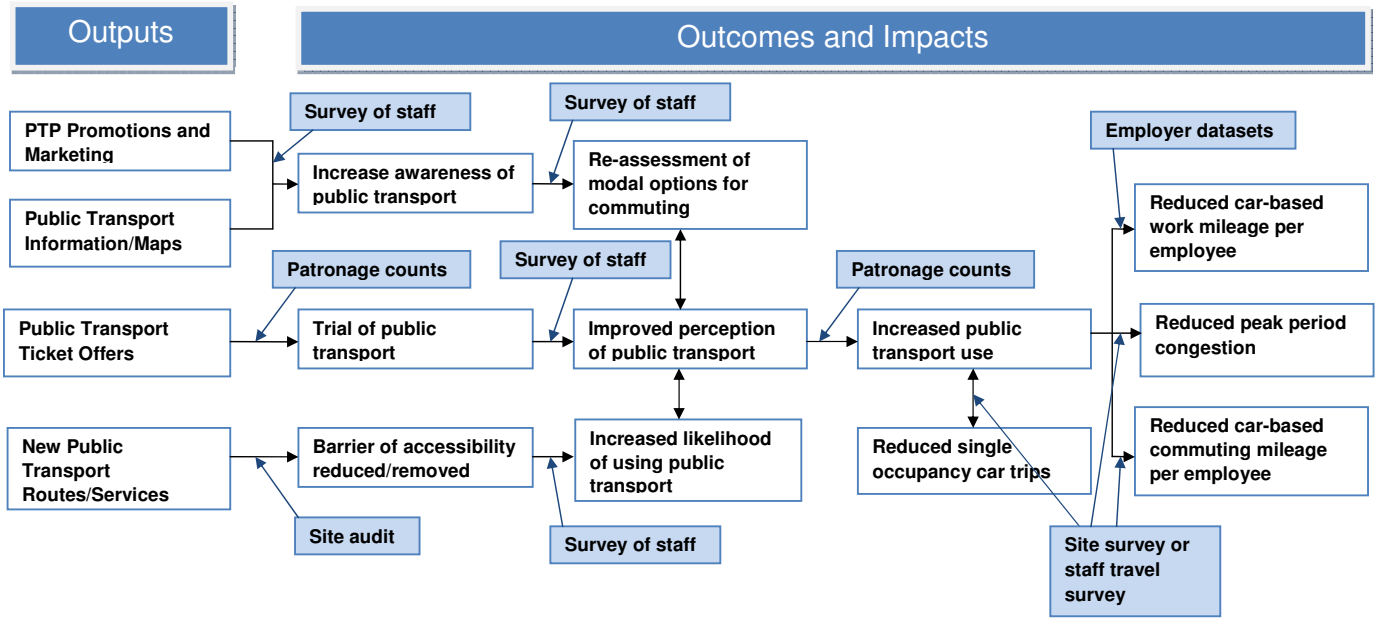


Figure A3: Business Park Outcomes Sub-Model



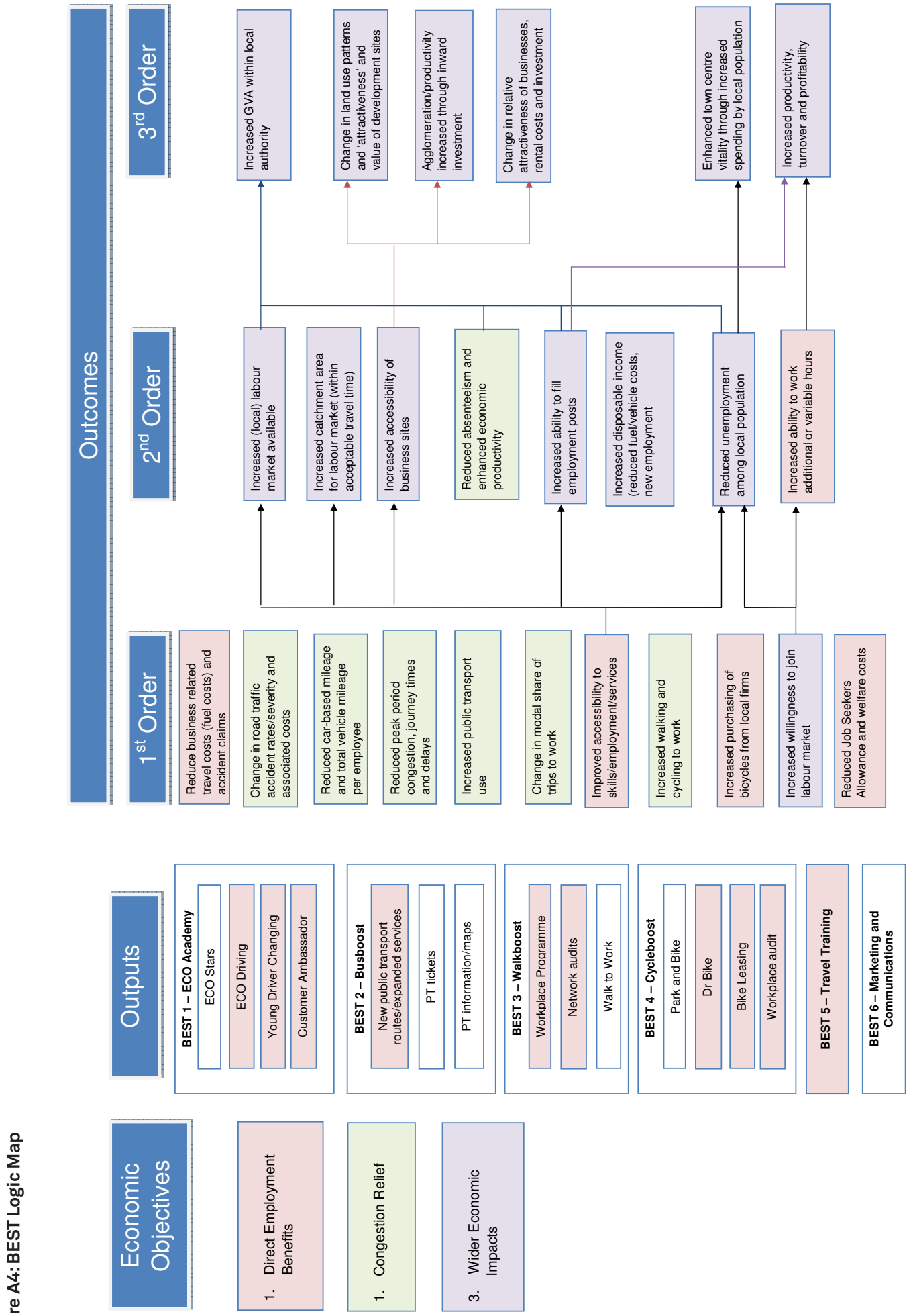


Figure A4: BEST Logic Map

Technical Appendix B – Cycling Count Methodologies

B.1 Introduction

The challenge of collecting robust and comprehensive cycling count data is summarised well by the 2012 Cycling Research International paper :

'The Department for Transport (DfT) has been concerned about [cycling] monitoring mechanisms for some time and accepts that surveys tend to under-record the level of cycling activity nationally, and that the incomplete coverage of surveying of traffic on minor roads, and lack of coverage on traffic-free routes, leads to an under-reporting and a lack of general understanding about the level and type of cycle activity. Current methods of analysis used for traffic counts are not sufficiently well disaggregated by route type to provide robust estimates of cycle traffic. Volumes of motorised traffic are much greater than those for cycling, and cycle usage patterns are more varied and seasonal than those of motorised forms of transport.'

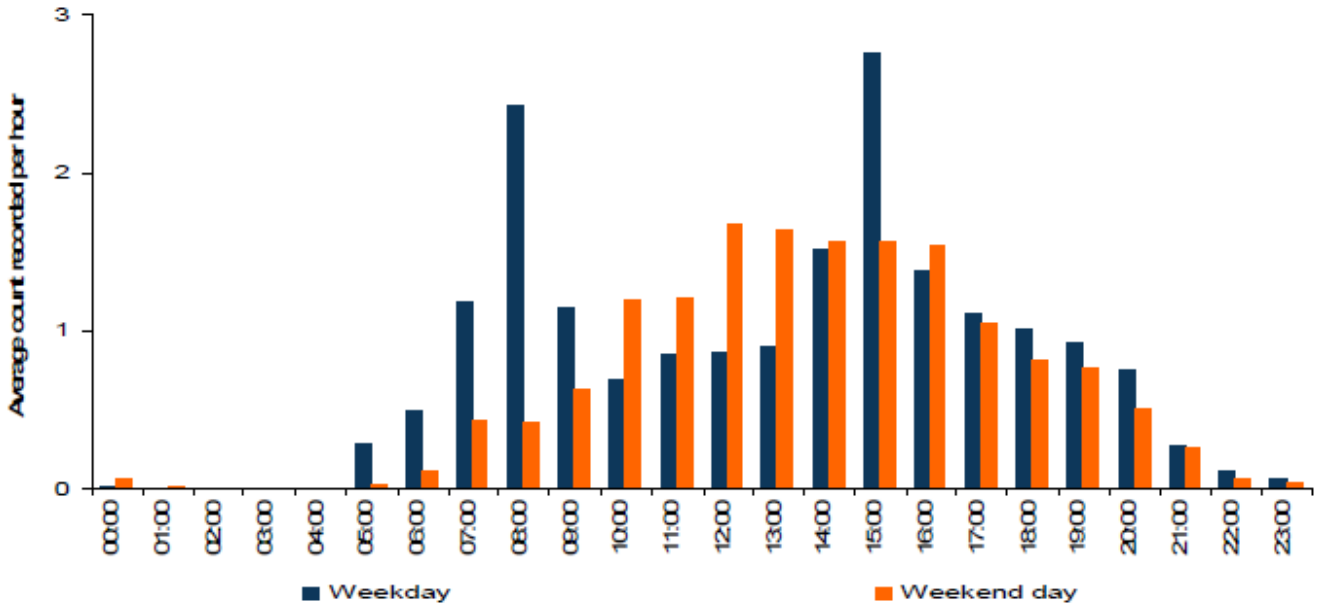
It is therefore important that robust methodologies are adopted for the monitoring of cycling activity within LSTF project areas.

B2. Automatic Cycling Counts

The focus of LSTF investment on promoting walking and cycling modes supports a comprehensive and robust approach to cycling count monitoring. TThe Cycling Demonstration Towns programme demonstrated the value of establishing a network of continuous automatic cycle counters (ACC), to provide direct observation data to be triangulated against telephone and household interview data respectively. The installation and maintenance of continuous counters also provides a source of data through which to consider seasonality, weekday and weekend, peak and off-peak patterns and the impacts of other network changes on cycling route choice (See Figure B1). There are a number of ACC techniques now available, including:

- **Inductive loops:** which consist of a coiled wire buried within the carriageway or cycle track (which can be bound or unbound surfaces) to create an electromagnetic field. When a bicycle crosses the field its presence is recorded by the counter unit. This type of ACC has the advantage of being relatively inexpensive, requires little maintenance and can be up to 95% accurate;

Figure B1: Example of ACC data distribution



- **Pneumatic Tube Counters:** which are surface mounted and laid in pairs and can detect the presence of bicycles, as well as the speed and direction of travel. The capital costs of installation are relatively low but the associated maintenance costs can be high as they are subject to damage by vehicles;
- **Piezoelectric counters:** Piezoelectric counters work by detecting the pressure made by a passing bicycle exerted on an embedded strip. These counters are generally up to four times more expensive than inductive loops but can be as accurate although this accuracy can reduce due to wear on the strip;
- **Radar detectors:** Radar detectors can provide good accuracy (over 90%) and can detect cyclists within mixed traffic flows. However, the need to site them out of the reach of vandals can make data retrieval more difficult and hence more costly; and
- **Other methods:** to provide data on cycle use can be gained from the following:
  - Travel behaviour surveys including travel diaries;
  - Satisfaction surveys (focus groups);
  - Surveys of physical activity;
  - Citizens' panel surveys; and

Census journey to work information (ten yearly cycle means information value reduces with time).

Despite the fact that ACCs are now more widespread and used routinely in LTP monitoring there remain a number of issues that affect the different designs/ techniques to a greater or lesser extent. In particular, the following should be taken into account when designing a ACC sampling framework:

- When sited within the carriageway ACCs can be triggered by passing vehicles unless they are sited where only cyclists may be expected to pass/trigger counter i.e. on the very near kerbside;
- ACCs may be triggered by other road or pavement users such as a wheelchair or mobility scooter;
- ACCs can only record bicycles that pass within range or over them (in the case of loops);
- ACCs are unable to distinguish between single and groups of cyclists; and
- All ACCs require calibration and control sites to be monitored to establish the accuracy/robustness of counts.

Given the above constraints and the associated implications for the analysis of data, it is recommended that ACCs should primarily be sited on segregated cycling infrastructure. Where counters are placed within the main carriageway consideration should be given to the alternative routes for cyclists along adjacent or parallel roads during the analysis.

If ACCs are installed on a temporary basis it is recommended to collect data for a minimum of two weeks per month. Furthermore, if monitoring is to be undertaken on a periodic repetitive basis, perhaps through the rotation of available counters around defined sites, it is essential that the data collection periods are the same in consecutive periods and years. When analysing ACC data best practice was noted in the Cycling Demonstration Towns report, where is was stated that count data should be used to:

"calculate the average daily counts of cycles recorded at each counter location in each month of the time series. Within this report three expressions of average are used:

- *the median daily count (based on seven days data);*
- *the week day median daily count;*
- *and the weekend day median daily count."* (Cycling England, 2009, p10)

Furthermore, the Cycling Demonstration Towns report recommended reporting the annual change in cycling as:

"the typical percentage change in the median daily count over a typical year." (Cycling England, 2009, p11).

When analysing ACC data it is important to note that such evidence should not be used to define changes in the overall levels of cycling in an area. Investment in cycling infrastructure, such as segregated routes, will attract cyclists currently using alternative routes. As outlined in Chapters Two and Four of this guidance, the important calculation is the net increase in cycling rather than the observed change in cycle counts at particular locations.

B3. Manual count data

Manual cycle count data should be collected for the following reasons:

- To provide an indication of the number of cyclist at a given point on a defined route;
- To validate ACC data; and
- To provide an indication of the changes in cycling for the same time period for sequential years or months.

Manual surveys should be undertaken for a 12-hour period and where possible for 2-3 days in a given week.

B4. Route User Intercept Surveys

In addition to ACCs, consideration should be given to the use of Route User Intercept Surveys (RUIS) as developed by Sustrans. These short interviews with cyclists are undertaken on segregated cycle routes and the data can be used to calculate a range of impacts including:

- Factors influencing decision to use the route;
- Potential impact on co2 emissions;
- Economic value of impacts of the intervention as defined by department for transport guidance on appraising walking and cycling interventions;
- Demographic reach of an intervention;
- Awareness of active travel;
- The extent to which severance has been overcome;
- Change in trip type, length and destination patterns; and
- People who have changed their travel behaviour due to the scheme.

RUIS should be used to provide additional detail and understanding of the ACC and manual cycle count data and used in the analysis of all available evidence. ACC or manual counts should be undertaken concurrently with RUIS to provide an estimate of the sample achieved at the site.

Technical Appendix C – Walking Count Methodologies

C1. Introduction

The monitoring of walking continues to have a lower profile than cycle monitoring, and little recent guidance is available on the alternative methodologies available. The following is a summary of the key techniques and issues to be considered.

C2. Origin/Destination Interviews

Origin/destination interviews are particularly appropriate for monitoring walking activity and mode share. They can provide information about the distance travelled and the modes used for each journey stage.

C3. Household Surveys and Travel Diaries

Household surveys, which may include some form of travel diary, can be useful for obtaining general information about walking (and other modes). Where questions about walking are included in household surveys, they should be kept simple and concentrate on common, easily-defined journeys, particularly education and work journeys.

C4. Manual Counts

Manual counts are the traditional method for counting pedestrians. Other information can also be recorded, such as gender, approximate age, walking impairment and luggage. The cost of the survey is related directly to survey staff time. If data is required for one day only, manual counts are relatively inexpensive.

C5. Automatic Count Methods

The use of automatic methods for monitoring pedestrian activity is currently very limited amongst local authorities. There are, however, several technologies in use, particularly for commercial purposes.

- Video imaging Walking activity can be captured by video camera and the data (eg pedestrian flows) obtained automatically by a microprocessor and appropriate software. This may be cost effective where prolonged monitoring is required.
- Infra-red sensors Infra-red sensors can be used to count pedestrians. The equipment is generally cheaper than video imaging but it is less flexible. It usually requires a bottleneck so that people are walking in single file when breaking the infra-red beam, otherwise the beam may not re-form before the next person walks through. As a result, this approach is unsuitable in town centres or on busy streets.
- Piezoelectric pressure mats Piezoelectric pressure mats have been used to count pedestrians and cyclists on some off-road paths.

C6. Choosing Suitable Sites

Because walk trips are short, and levels of walking can vary considerably from one street to another in the same town, the choice of survey site is important. The count sites should be in areas of high walking activity, such as the approaches to town centres, stations and points where residential feeder roads join the main highway network. Counts from sites with high levels of walking activity tend to offer consistent results, which can be readily compared to counts in other places and at other times. However, if sites have very high pedestrian flows, it may be difficult for enumerators to cope. In that event other methods (such as video) may be required, or alternative sites selected.

C7. Destination Surveys

Surveys at key destinations such as schools, offices and factories can provide valuable data on walking and may allow long term monitoring to be undertaken. This can be compared to a baseline at these destinations. Those organisations with an interest in travel plans may be willing to undertake such surveys. With the addition of surveys at control destinations, it is possible to measure the changes due to travel plans, not only against a particular organisations baseline, but also against the control.

C8. Cordons and Screenlines

A number of local authorities undertake cordon or screenline traffic counts on a regular basis. If these are manual counts, it may be useful to include pedestrians. That would also enable a better estimate of modal split to be determined. Existing cordons or screenlines may need to be modified to be suitable for monitoring walk trips. Screenlines are generally more suitable for walk trips, as they can cover both radial and orbital trips. The aggregate count across a cordon or screenline is more reliable than the individual counts.

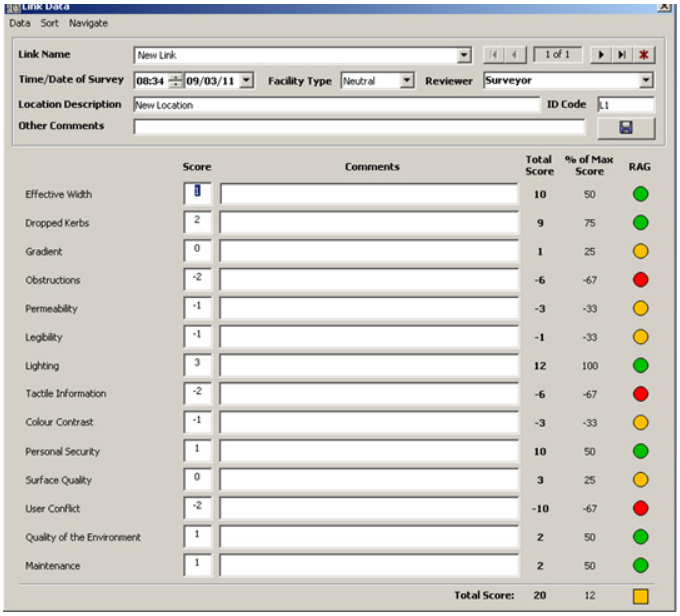
C9. When to undertake surveys

The ideal time for monitoring walking activity is when flows are highest. That is usually in June, and is linked to good weather and longer hours of daylight. However, because most walk journeys are for utility reasons, the number of walk journeys per month does not vary greatly - unlike cycling. School holidays influence walking patterns and the purpose of a trip is often time dependent. It is uncertain to what extent the weather influences the amount of walking activity overall. It is likely that leisure walking is more strongly affected by weather conditions than walking for utility purposes.

Technical Appendix D – PERS

D1. Introduction

The Pedestrian Environment Review System or PERS is an evaluation framework for assessing the quality of pedestrian streetscape provision.



The tool is comprised of a detailed scoring methodology broken down into constituent elements of the pedestrian environment: links (lengths of footway); crossings; public transport waiting areas; public spaces; interchange spaces; and routes. Each of these elements has its own scoring framework, to which a seven point scale (+3 to -3) is applied to parameters such as: Surface Quality; Legibility for Sensory Impaired Pedestrians; and Maintenance. Guidance on scoring is contained within an extensive PERS User Manual, though it is recommended that formal training is undertaken to ensure quality and consistency.

In support of the scoring framework PERS is also a software tool. The +3 to -3 scores collected on-site are inputted into the software, at which point a weighting is assigned to each score. These weighting parameters give priority to issues such as safety and provision for mobility and sensory impaired pedestrians over 'softer' factors such as sense of place.

D2. What are the benefits of using PERS?

PERS is a cost-effective tool for delivering standardised evaluations of streetscape pedestrian provision, balancing quantitative scoring with the insights offered by structured qualitative analysis. PERS can be applied for a number of strategic purposes, including:

- Comprehensive auditing of pedestrian provision to aid in the design of public realm improvements;
- 'Before and after' evaluation as a means of assessing the benefits of investment;
- Issue-based audits where there are known concerns over pedestrian provision, using PERS as a tool for prioritising the locations most in need of improvement;
- The design of comprehensive transport networks with optimised pedestrian interfaces; and
- Appraisal of detailed design options.

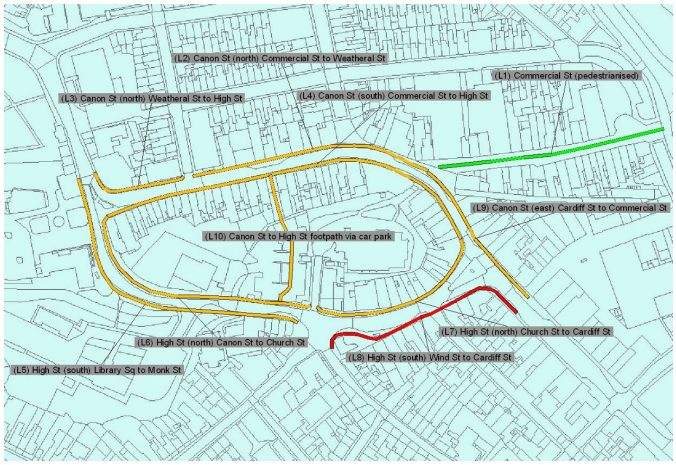
Above all PERS brings the benefits of being a tried and tested audit methodology which has been applied in numerous locations, from the strategic environment of London's busiest pedestrian areas (including Oxford Street and Marylebone Road) and the Olympic walking routes, to town centres of all sizes across England and Wales.

Example Case Study – Evaluation of Town Centre Regeneration Investment in Rhondda Cynon Taf (RCTCBC)

PERS has been adopted as part of a comprehensive evaluation of their public realm investments in Pontypridd, Aberdare and Ferndale. A 'baseline' evaluation has been undertaken, including a PERS audit, a Community Street Audit (CSA) involving local

stakeholders, and analysis of key datasets such as retail unit vacancies and shopper perceptions surveys. The PERS audit and CSA will be repeated, along with other data analysis activities, once the public realm improvements have been completed in 2014. This project is ongoing but has received praise from the Client regarding the quality of evidence generated through the PERS audit.

Project Case Study – Lee Valley White Water Centre, Olympics Walking Routes (ODA)



PERS has been used to develop Olympics Venue Transport Operations Plans for various facilities across Greater London. PERS was used to audit the proposed walking routes to Lee Valley White Water Centre from local public transport hubs, leading to recommendations for both permanent provision and temporary event day facilities.

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