Monitoring and evaluation of walking and cycling (draft)

November 2014
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This chapter of the Sustrans Design Manual should be read in conjunction with Chapter 1 “Principles and processes for cycle friendly design.” That chapter includes key guidance on core design principles, whether to integrate with or segregate from motor traffic, the space required by cyclists and other road users as well as geometrical considerations. Readers are also directed towards the “Handbook for cycle-friendly design” which contains a concise illustrated compendium of the technical guidance contained in the Design Manual. This chapter has initially been issued as a draft and it is intended that it be reviewed during 2015; feedback on the content is invited and should be made to designandconstruction@sustrans.org.uk

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1. Key principles

- monitoring the impact of past interventions can strengthen the case for future investment
- monitoring must be planned to address the scheme objectives
- tools for data collection will be selected according to the information required
- investment in data gathering should take into account the scheme cost
- the costs of data collection should be factored in when first estimating the cost of a scheme
- key results should be presented in a form that is relevant and accessible to key stakeholders and funders

2. Introduction

2.1
It is vital that authorities establish a programme of active travel monitoring, which will establish a baseline and changes will be measured from that. This will inform priorities and help make the case for continued investment, show where further investment is needed and provide data for the planning and design of networks and facilities.

2.2
As part of the development of individual improvement schemes, monitoring should be considered from the outset and should be built into all projects. How the success of any improvements will be monitored will need to be considered prior to commencing work.

2.3
This chapter explores some of these reasons and details how monitoring and evaluation can be approached.

Counter powered by photo-voltaic panel

Installation of cycle counters should be factored into the cost of path construction
3. Why monitor?

3.1 The function of gathering data around the usage and impact of routes serves the need for justification of existing plans and developments and the advocacy of new proposals and exploring future options.

- data relating to a given route or network can be used to examine the efficacy of the development, to report back to funders, to generate public support, or to make the case for continued improvement.
- when planning a new route or network, or improvements to existing resources, data from other similar routes and networks can be used as the basis for forecasting what usage and impact might look like following the intervention, and for making the case to support the proposition.

3.2 Funders are typically very keen to see evidence of the impact of the scheme post implementation. The case for future funding or providing support at public consultation can be enhanced by a quantified (and qualitative) examination of usage.

4. How to approach data gathering

4.1 At the outset a monitoring and evaluation plan should be developed for any intervention and the costs of this should be factored in when evaluating the cost of the proposed infrastructure. The plan would typically be some variant on a logic map or logic framework – a systematic and visual presentation of the key steps required to develop a monitoring programme based on the scheme objectives. This requires the identification of aims, objectives, inputs, outputs, outcomes and impacts. A simple example is given in Figure 4.1.

<table>
<thead>
<tr>
<th>Objective</th>
<th>Input</th>
<th>Output</th>
<th>Outcome</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improve cycling safety</td>
<td>Infrastructure improvement resources</td>
<td>Physical route, signage etc</td>
<td>Increased usage, improved perceptions of safety etc</td>
<td>Reduction in incidence of accidents, congestion reduction etc</td>
</tr>
</tbody>
</table>

4.2 Even in the context of a route or network-type intervention, the breadth of the parameters can range widely:

- what is the route for? (objectives: provision of a tourism resource, increasing commuting, making journeys to school safer);
- what might the route achieve? (outcomes: increased tourism activity, increased commuting, improved perceptions of safety);
- what results from the intervention? (impacts: increased tourism revenue, reduced absenteeism, reduction in accidents).
4.3
The approach to data gathering, as well as being subject to the monitoring plan, must consider the characteristics of the route or network in question. There are no quick fix ‘counts required per kilometre’ or ‘survey this many users’. Rather, the data to be collected should directly address the intended outcomes and impacts, and should relate to what is on the ground. Is there a suitable location for an automatic counter on the route/network? Are there schools/ workplaces that are served by the route/network where data can be gathered? Are there ‘braids’ in the route/network that dictate cyclist and pedestrian flows?

4.4
The other key constraint is cost. The investment in data gathering needs to be proportionate and address the outcomes and impacts cost-effectively. Scaling of costs is not a simple formulaic matter. If a more detailed data set is required, costs are inevitably higher. A low cost scheme may not necessarily correspond to a scheme with a minimal data requirement. Examples in Sustrans’ own portfolio include circumstances where 1% of a multi-million pound investment has been spent on monitoring, and where monitoring has amounted to around a quarter of total project cost.

4.5
Appendix A provides an example of a case study for monitoring a link between two settlements.

5. Data gathering tools available

5.1
A very wide range of tools for data collection is available. These should be selected according to the information outputs to be generated for the monitoring plan. It is absolutely crucial to consider what might already be available from national or local datasets that meet your need before embarking on tool selection.

5.2
For the monitoring and evaluation of walking and cycling, Sustrans’ research and monitoring unit is able to draw on a number of tried-and-tested, existing tools. This makes any data collection, analysis and comparison to other projects more robust, easy to implement and more cost-effective. Appendix B lists these tools, along with a basic indication of costs, and considers their scale of application. The costs of data capture, collation, analysis and reporting all need to be considered and should be factored in when estimating the total scheme cost.
6. Analysing the data

6.1 The analysis should be planned at the stage of designing the data collection approach and should respond directly to the requirements of the monitoring plan. For instance, there would be no requirement to report on trips to school if the primary outcome measure is tourism-derived revenue.

6.2 The complexity of assembling an expression of impact depends on the reporting needs and the data sources used. It is relatively easy to report on the usage of a short stretch of route if you have counter and user intercept survey data available.

6.3 However, this approach can risk significantly underestimating usage on a more complex network due to the failure to account for sections of the route not covered by data collection activity.

6.4 Sustrans’ Whole Scheme Usage Estimate (WSUE) tool goes beyond traditional approaches to analysing route usage by using a variety of data types to describe the volume and characteristics of journeys at specific points. This data can then be used as a proxy for the usage on the surrounding area. It allows geographically distinct sources of data, collected on a network of routes, to be combined to estimate use across that network. This approach can generate a single annual usage estimate for a walking and cycling infrastructure scheme for both pre and post (where data permits) scheme construction. More details of this are included in Appendix C.

7. Expressing usage and impact

7.1 The output from the analysis is required to communicate the usage and input and should already be clearly expressed in the monitoring plan. Options might reasonably be expected to include:

- measures of levels of walking and cycling
- measures of change in:
  - levels of walking and cycling
  - levels of walking and cycling among particular user groups
  - levels of walking and cycling by particular trip type category
  - perceptions of safety
  - perceptions of other facets of a route
  - revenue generation performance of a route
  - health benefits associated with a route
  - economic benefits associated with a route
- benefit to cost ratio of a route

7.2 Presentation of these results must have regard to the target audiences and be accessible to them. Whilst a detailed analysis may be appropriate for a more technically minded audience, a strong emphasis on more visual representation of key results will be more suited to others.
8. Key References
Guidance on Monitoring Local Cycle Use, TRL Report 395, 1999
Research on Monitoring Local Cycle Use, TRL Report 396, 1999
Guidance for Providing for Journeys on Foot, The Institution of Highways & Transportation, 2000

Appendix A: Case study – a link between settlements with crossing

Locations for data collection:
- Site A, manual count – counts cycling, walking and other traffic on the road to which the new link runs parallel; before and after construction
- Site B, automatic cycle counter – counts cycle flows on new link north end
- Site C, route user intercept survey – counts and surveys users close to the new crossing
- Site D, automatic cycle counter – counts cycle flows on new link in north part of town
- Site E, manual count – counts cycle and peds on, accessing and egressing the new link at a key junction
- Site F, automatic cycle counter – counts cycle flows on new link in south part of town

Monitoring Proposed:
New Monitoring (A-F)
- A Manual count - Near Greystones, Lincoln Road
- B Automatic cycle counter - A15 Linslade (Greenway parallel to Lincoln Road)
- C Route User Survey - Holderness Road
- D Automatic cycle counter – M1510 Gala Way
- E Manual count - Near Railway Bridge
- F Automatic cycle counter - North Gate, near Claybourn Drive
Core Route Elements
## Appendix B: Tools available for monitoring

<table>
<thead>
<tr>
<th>Tool</th>
<th>Indicative cost</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Quantitative Tools:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Automatic bicycle/pedestrian counts</td>
<td>•••</td>
<td>Initial investment costs are high due to hardware costs, and there is an ongoing maintenance liability; extent of costs depends on number of counters required, and intensity of coverage required; costs can range from £1,500 to £5,000 per counter unit, depending on specification</td>
</tr>
<tr>
<td>Manual bicycle/pedestrian counts</td>
<td>••</td>
<td>No hardware costs, but an ongoing cost in commissioning repeat counts; frequency and the number of points to be covered are the primary determinants of cost; expect to pay a standard day rate per count day per site per iteration</td>
</tr>
<tr>
<td>Video counts</td>
<td>••</td>
<td>Modest hardware cost and installation costs, but data is not continuous unless repeat periods of operation are scheduled</td>
</tr>
<tr>
<td>Cycle parking counts</td>
<td>•</td>
<td>Once the survey beats are designed, cost is usually relatively modest; expect to pay a standard day rate per person required per iteration</td>
</tr>
<tr>
<td>Beneficiary and participant count record and surveys</td>
<td>•</td>
<td>Tools can be supplied at modest cost; main cost is the time of the project delivery team in administering the tools</td>
</tr>
<tr>
<td>Route user intercept surveys</td>
<td>••</td>
<td>Sustrans’ standard is four days coverage per survey event, usually using two people per site; cost is therefore standard day rate times eight for data collection</td>
</tr>
<tr>
<td>Household travel behaviour survey</td>
<td>••••</td>
<td>Usually very expensive for very strong data; survey design and sampling are part of the process, but the bulk of the cost is surveyor time; key cost determinants are level of coverage with respect to sample size and statistical surety; expect to pay £40,000-90,000 per iteration; typical sample size required would be around 1000 households</td>
</tr>
<tr>
<td>Workplace travel surveys</td>
<td>•</td>
<td>Tools can be supplied at modest cost; main cost is the time for administering the survey, which can be provided by the workplace or by Sustrans</td>
</tr>
<tr>
<td>School travel surveys</td>
<td>•</td>
<td>Tools can be supplied at modest cost; main cost is the time for administering the survey, which can be undertaken by the school or by Sustrans</td>
</tr>
<tr>
<td><strong>Qualitative Tools:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Community impact evaluation</td>
<td>•</td>
<td>Tools can be supplied at modest cost; main cost is the time of the project delivery team in administering the tools</td>
</tr>
<tr>
<td>Process evaluation</td>
<td>•</td>
<td>Modest costs, requiring a series of interviews with a defined range of stakeholders</td>
</tr>
<tr>
<td>Evaluative exploitation of social networking sites, etc</td>
<td>•</td>
<td>Modest costs, but needs a clear plan of operation</td>
</tr>
<tr>
<td><strong>‘Context’ Tools:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intervention diary</td>
<td>•</td>
<td>Tools can be supplied at modest cost; main cost is the time for entering data, which is best done by the project delivery team</td>
</tr>
<tr>
<td>Ancillary data</td>
<td>•</td>
<td>Limited cost for collating existing data; main bulk of costs are for analysis and reporting</td>
</tr>
</tbody>
</table>
Appendix C: Estimating total cyclist and pedestrian usage of a small network

Introduction

Sustrans’ Research and Monitoring Unit (RMU) uses a number of data collection tools and analytical approaches to express the impact of interventions to best effect. One particularly challenging methodological question is that of how to estimate usage on a whole network using data from a number of different sources at a series of ‘point’ locations.

Historically, data from a single point has been used as a proxy for usage across the scheme. This works well for a short, linear scheme, but where the intervention is a more complex local network this approach is less effective. On both simple, linear schemes, and more complex networks where data has been collected from multiple points, Sustrans has developed ad hoc methodologies that allow these data to be knitted together to provide a composite picture of usage.

This appendix provides an overview of a methodological approach developed during the Connect2 programme.

Whole Scheme Usage Estimate

The Connect2 programme has offered Sustrans’ RMU an opportunity to consolidate their experience in this area and articulate a replicable, robust methodology for estimating usage on a route or network – a Whole Scheme Usage Estimate (WSUE). All of the Connect2 schemes were delivered as ‘mini-networks’, hence the need for a more consistent and sophisticated approach to dealing with this problem.

The WSUE tool follows a five stage process to generate usage figures (see Figure C1 below).

Overview of Approach

The WSUE tool enables geographically distinct sources of data collected on a network of routes to be combined to provide an estimate of overall use.

The approach allows definition of an area within which the usage data from a single point can be reliably assumed to reflect actual usage on a network or part of a network. Where multiple data points exist, the same method is used; allowing a picture of usage across the scheme to be built.

For the sections of the scheme not covered by the data, assumptions are made about usage based on the nearest data available and local knowledge of the surrounding area.

The WSUE tool then draws these different usage estimates together from distinct segments to provide a more complete picture of usage across the scheme.

The tool uses journey purpose data from Route User Intercept Surveys to inform how networks of routes are used. This feeds subsequent assumptions regarding usage type, average trip distances, and the spread of journeys. For segments of schemes that are not covered by nearby monitoring locations, referred to as ‘black spots’ in monitoring, a formula is applied using data collected elsewhere on the scheme to

Fig C1: The five stages of developing whole scheme usage estimate

1. Obtain scheme details, source monitoring data
2. Understanding the scheme
   - Connectivity of elements
   - Trip length/journey purpose
   - Potential for double counting
3. Calculating the scheme segment lengths and spatial analysis of the scheme to inform WSUE calculation
4. Select data sources to be utilised
5. Calculate WSUE
make an estimate of use on these segments. If there is an expectation of double counting of route users from close together monitoring sites then a reduction is applied based on journey purpose and origin and destination data from Route User Intercept Surveys, and supporting data from the Department for Transport’s National Travel Survey.

The WSUE methodology is broadly uniform across schemes, whilst being flexible enough to deal with variations between schemes in terms of data availability and scheme complexity.

The approach acknowledges the difficulty in making scheme-wide estimates of usage from limited data, and the risks of both under and over estimation. All sources of data are considered in the process, although not all are used in the final calculation, so as to achieve as representative a picture as possible of scheme use within the constraints of the information available.

More detail of the five stages is provided in Table C1. Further information on this approach is available from Sustrans RMU.

<table>
<thead>
<tr>
<th>Stage</th>
<th>Key Components</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>obtain scheme details and scheme alignment details</td>
<td>schematic map of scheme and the location of known monitoring points</td>
</tr>
<tr>
<td></td>
<td>source monitoring data</td>
<td>collation of all available monitoring data and the usage estimate from each</td>
</tr>
<tr>
<td>2</td>
<td>understanding the scheme by assessing the scheme details and monitoring data sourced</td>
<td>decision on whether to split scheme into sections</td>
</tr>
<tr>
<td></td>
<td>using Sustrans survey data in conjunction with NTS data</td>
<td>understanding why and where people are travelling</td>
</tr>
<tr>
<td></td>
<td></td>
<td>understanding the flow of journeys</td>
</tr>
<tr>
<td></td>
<td></td>
<td>calculating the average length of trips made on the scheme</td>
</tr>
<tr>
<td>3</td>
<td>calculate scheme segment lengths and spatial analysis</td>
<td>understand the spatial relevance of monitoring points in relation to the total extent of the scheme length and scheme extremities</td>
</tr>
<tr>
<td></td>
<td>calculating all relevant distances on the route to inform analysis</td>
<td>identifying un-monitored segments</td>
</tr>
<tr>
<td></td>
<td></td>
<td>identifying distance between monitoring points</td>
</tr>
<tr>
<td>4</td>
<td>select data sources to be utilised</td>
<td>selecting which data sources to utilise and ascertain where further assumptions may be required to estimate usage, such as proxy usage estimate</td>
</tr>
<tr>
<td>5</td>
<td>calculating the Whole Scheme Usage Estimate</td>
<td>usage data calculated for each segment of the scheme are summed to generate a WSUE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>accounting for any double counting</td>
</tr>
<tr>
<td></td>
<td></td>
<td>where data permits this can provide a comparison of usage on a scheme pre and post construction</td>
</tr>
<tr>
<td></td>
<td></td>
<td>provide inputs for BCR analysis</td>
</tr>
</tbody>
</table>