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Project Appraisal Guidelines
Unit 2.3 – Logic Path Modelling

PE-PAG-02045
February 2023

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PE Planning & Evaluation

Technical

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1. Introduction

1.1 Overview

The following Project Appraisal Guidelines (PAG) Unit 2.3 has been developed to support transport evaluators, policy makers, local authorities, and organisations involved in the implementation and evaluation of transport interventions delivered under the aegis of Transport Infrastructure Ireland (TII). The purpose of the Unit is to supplement available guidance on Logic Path Models (LPM); and assist in developing effective LPMs by providing clear definitions of each LPM element and a step-by-step development process.

1.2 Logic Path Modelling in Irish Appraisal Guidance

1.2.1 Public Spending Code

The Public Spending Code (PSC), published by the Department of Public Expenditure and Reform, outlines the requirements for evaluating, planning and managing public capital investment; including the purchase or acquisition of assets or shareholdings, in Ireland.[1] Logic Path Modelling (LPM) is discussed within Section 3, Box 3.2 of the PSC. Within the PSC, LPM is described as providing a systematic and visual means to demonstrate and share knowledge of the cause-effect links between inputs, activities, outputs, and outcomes (results and impacts). The PSC also recognises the value of LPM in assisting with the setting of Key Performance Indicators (KPI) for a proposed intervention, which are further explained in Sections 2 and 3.9 of this Unit. An extract of the logic path model process as set out in Box 3.2 is shown in Figure 1.1.

Figure 1.1 Logic Path Model[2]

1.2.2 Common Appraisal Framework

The Common Appraisal Framework (CAF), published by the Department of Transport, provides high level appraisal guidance across the transport sector, and aims to develop a common framework for appraising transport investments in accordance with the PSC.[3]

In Section 2.2., the CAF highlights the need for **'logic linking'** between project objectives to both outputs and outcomes, as part of the Strategic Assessment Report (SAR) and the Preliminary Business Case. The CAF states that objectives should have a clear purpose with a 'logic linking' to both outputs and outcomes. These objectives should be SMART (Specific, Measurable, Attributable, Realistic and Timely) and relevant data should be identified to measure these at the earliest possible stage.

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[1] Department of Public Expenditure and Reform (2019), 'Public Spending Code – A Guide to Evaluating, Planning and Managing Public Investment'.
[2] Public Spending Code – A Guide to Evaluating, Planning and Managing Public Investment (2019)
[3] Department of Transport (2016), 'The Common Appraisal Framework for Transport Projects and Programmes', last updated (October 2021)

1.3 Project Appraisal Guidelines Overview

PAG Unit 2.1 introduces the Strategic Assessment Report (SAR) and provides guidance on the structure and content of a SAR. PAG Unit 2.2 – provides SAR guidance specific to Active Modes and Greenways schemes. Both Units introduce Logic Path Modelling as a useful framework to develop and organise the KPIs, and to demonstrate how they link to the overall project objectives.

Therefore, this PAG Unit 2.3 has been developed as an ensuing Unit; and provides transport evaluators, policy makers, local authorities, and organisations involved in the implementation and evaluation of transport projects (under the aegis of TII) with clear and effective guidelines to develop LPMs in practice.

1.4 Logic Path Model

Logic Path Modelling (LPM), often referred to as a Logic Map or Programme or Project Logic Model, is a concise articulation of the issues identified, the scheme objectives, and the desired scheme outcomes. LPM can assist in setting out how the project team can achieve those scheme outcomes. It is also a useful tool to develop and organise KPIs to measure performance of different options, project benefits and to demonstrate how they link to the overall project objectives. KPIs can be utilised for both the appraisal of options and the evaluation of the scheme in the future. Figure 1.2 displays a diagram of the LPM causal pathway, as well as examples for each element. Section 2 elaborates further on each of the LPM elements.

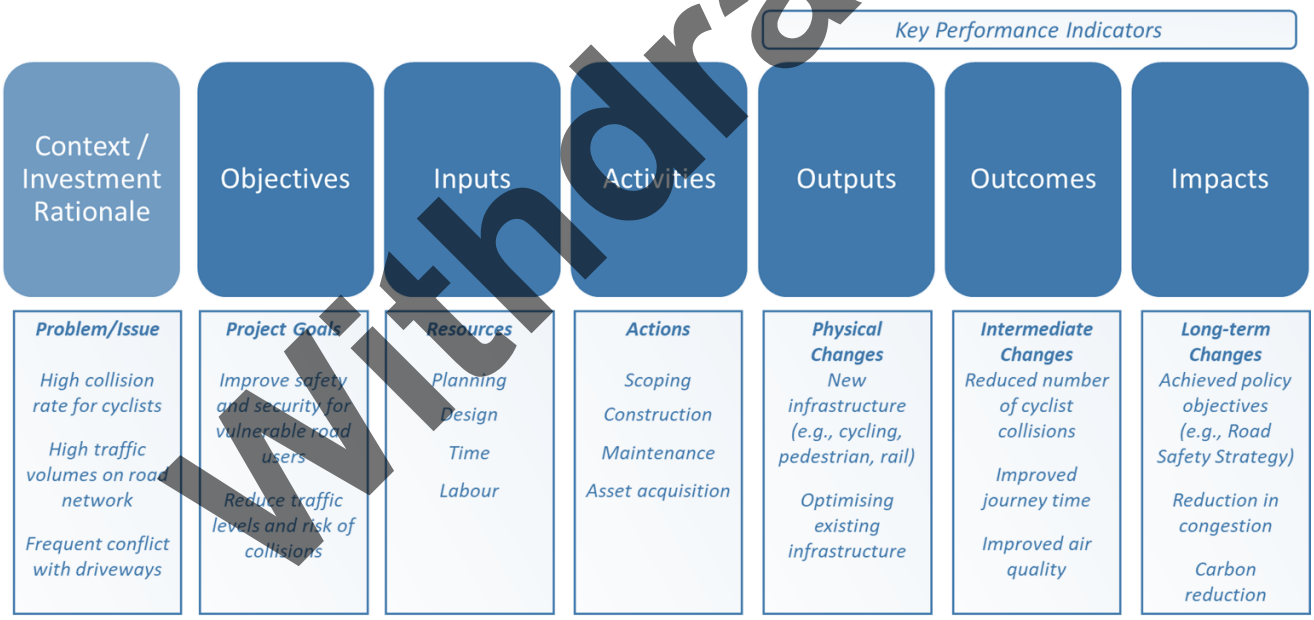

Figure 1.2 Logic Path Model with Examples

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2. Logic Path Modelling Structure and Key Components

Overview

LPMs are part of the 'Backcasting' method of defining a desirable future; and working backwards to identify actions, resources and activities that are required to realise that goal. As LPMs place an emphasis on ultimate outcomes or results, evaluators are prompted to consider how best to achieve the desired results from an intervention.

Several elements essential to the development of the proposed intervention must be identified and described. These elements make up the LPM as shown in Figure 2.1.

Figure 2.1 LPM Structure and Key Components

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Context / Investment Rationale

As a prerequisite to developing a LPM, the context / investment rationale (also referred to as the 'case for change'), must be identified by articulating the issue that the intervention aims to resolve or the issues that it will address. Further guidance in this regard is available in PAG Unit 2.2.

Objectives

Objectives are an articulation of the type of outcomes the intervention is trying to achieve; and they should be identified after due consideration of the problem. There may be an overall objective, such as reducing emissions from transport, with a sub-set of objectives underpinning the main objective e.g., increasing walking and cycling; reducing vehicle kilometres travelled by internal combustion engines. Once the objectives are clearly defined, they can be 'linked' to a specific set of desired outputs and outcomes. Further guidance in relation to the development of scheme objectives is provided in PAG Unit 2.2.

Inputs

Inputs are the resources required to develop the intervention. This may include financial resources, personnel, partners, or organisations involved, data, design standards and technology to be used. This establishes 'What is required' to implement the changes. The list of inputs should be as detailed and specific as possible.

Activities

Activities refer to the actions required for the implementation of the intervention. This explains 'How it will be done' and could include activities such as constructing, purchasing, organising, innovating, delegating and governing.

Outputs

The outputs refer to the physical or tangible assets that will be delivered as a result of the intervention; for example, optimised infrastructure or new infrastructure constructed. At the SAR stage, it is not possible (or expected) to be prescriptive about the type/option of infrastructure or solutions that will be delivered.

Outcomes

The outcomes refer to the short to medium term changes that the intervention is meant to accomplish. For instance, a reduction in traffic congestion, modal shift, decarbonisation of transport services, change in attitude or behaviour. When setting out the desired outcomes, care should be taken to express the benefits an intervention is expected to provide and outline those whom are likely to benefit. Construction of infrastructure is not an outcome in itself.

Impacts

The impacts are the wider effects the intervention will support in the longer term. For instance, giving effect to policy goals such as: contribution to national climate change goals, improved safety, security and health of the population or greater equality of opportunities.

Key Performance Indicators (KPI)

KPIs are indicators used to track the delivery of aspects deemed essential to the accomplishment of a transport intervention's outputs, outcomes, and impacts. The KPIs (appraisal and evaluation) will serve as the foundation in the option selection process and the subsequent monitoring and evaluation strategy respectively, which is created in the early stages of the Appraisal process at SAR stage. They can be updated as necessary and implemented through the project lifecycle. Through the LPM, Sponsoring Agencies can determine the KPIs at a high level for and from the proposed intervention.

Section 3 provides a step-by-step guide for assembling each of these elements into an effective LPM.

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3. Step-by-Step Guide to Developing a Logic Path Model

3.1 Overview

The method to develop a LPM is illustrated by Figure 3.1. It can be seen in this illustration that the reader is to follow the flow from left to right, but LPMs should generally be developed from right to left according to the following steps:

Prerequisite – Context / Investment Rationale: Articulate the issues concisely

Step 1 – Objectives: Identify the overall project goals related to the rationale

Step 2 – Impacts: Identify the long-term effects

Step 3 – Outcomes: Identify the intermediate effects

Step 4 – Outputs: Identify the physical results of the project

Step 5 – Activities: Identify the actions required

Step 6 – Inputs: Identify the resources required to undertake the activities

Key Performance Indicators: Measure the change by identifying the KPIs

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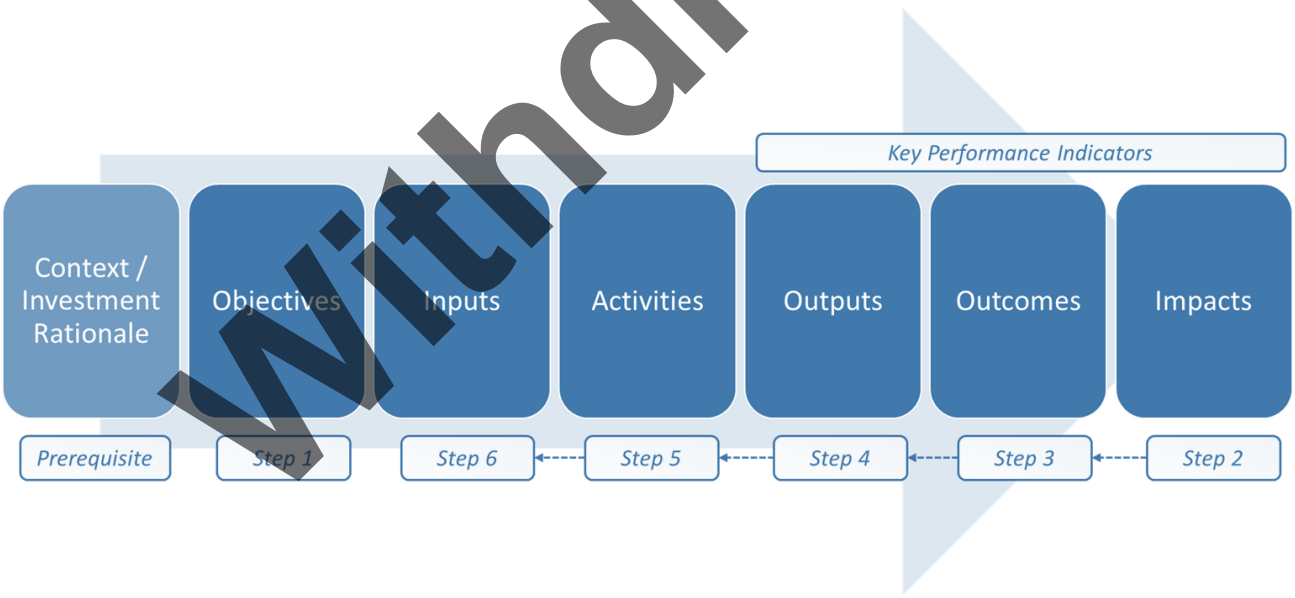

Figure 3.1 Development of LPM Structure and Key Components

3.2 Prerequisite: Identify the Context / Investment Rationale

A prerequisite to developing a LPM requires the identification of the **context / investment rationale** for the intervention. It is important to highlight in this step concisely, the issues that are driving the need for change, providing rationale for the project investment. For example, the context may refer to national transport policies, regional / local problems or wider factors that must be supported by an intervention.

Further guidance on the investment rationale is contained in PAG Unit 2.1 and PAG Unit 2.2. The investment rationale/need for the scheme will be first outlined in the Phase 0 SAR, before being updated and expanded in the Phase 1 Feasibility Report.

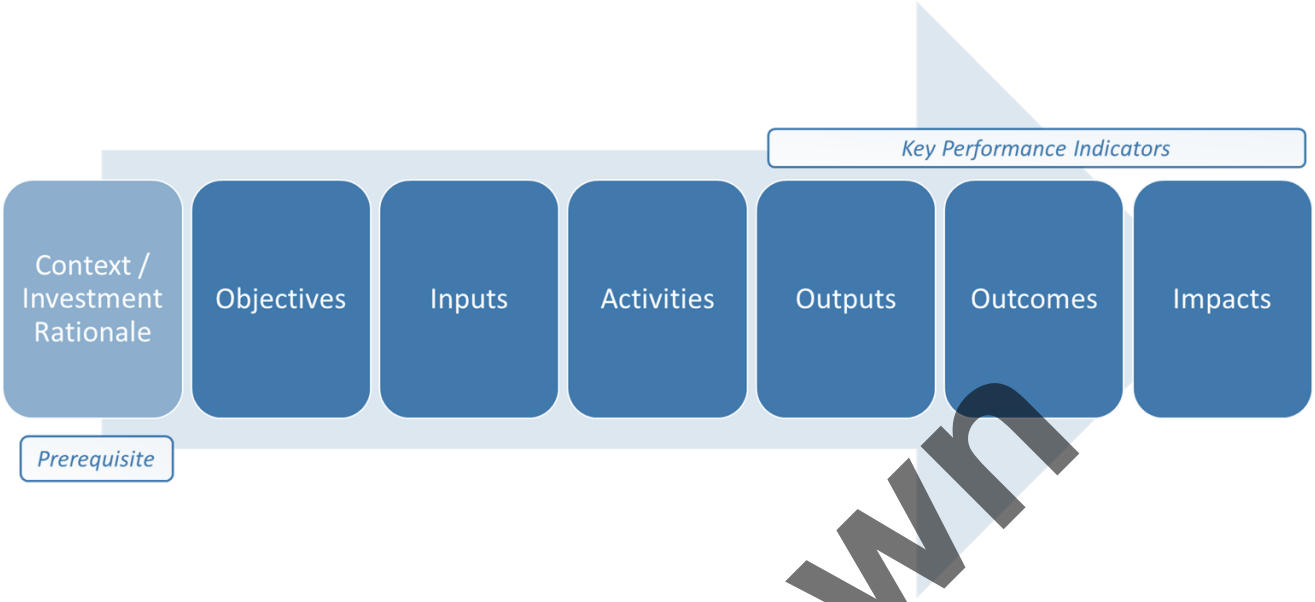

Figure 3.2 Prerequisite of LPM Development– Context / Investment Rationale

Useful questions to ask while completing this step include:

- What is the problem that has been identified – who has identified this, and why now?
- What is the evidence indicating that this is a problem?
- What local issues and priorities does the intervention originate from and support (transport, local economic development, social inclusion objectives health, environment…)?
- Are there any other contextual factors that may influence the ability of the intervention to achieve its outcomes and impacts?

3.3 Step 1: Outline the Objectives

The first step in the development of a LPM involves outlining the proposed intervention's **objectives**. LPM's are most effective when developed alongside objectives, at the beginning of SARs, as opposed to in the evaluation and monitoring phase. This prompts the evaluator to keep the 'intended result' in sight, while considering how to achieve that desired outcome. The PSC does not link the LPM to the project objectives. However, linking objectives to the LPM can be useful to ensure that both objectives and LPM are aligned. Benefits to this approach are as follows:

- Provide stakeholders with clear direction on what is to be accomplished.
- Acts as a basis for directing and guiding the entire appraisal process.
- Introduces clarity and establishes a mechanism to assess potential scope creep.

It is recommended to identify objectives with SMART principles in mind. These refer to Specific, Measurable, Accurate, Realistic, and Timely objectives. Applying SMART objectives ensures that they can be used throughout the initial option identification, transport appraisal, implementation process and post evaluation stages of investment lifecycle.

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SMART indicators can help to monitor the extent to which objectives and targets have been met along with assessing the intended change that the intervention might bring about. Further guidance on SMART objectives is set out in PAG Unit 2.2.

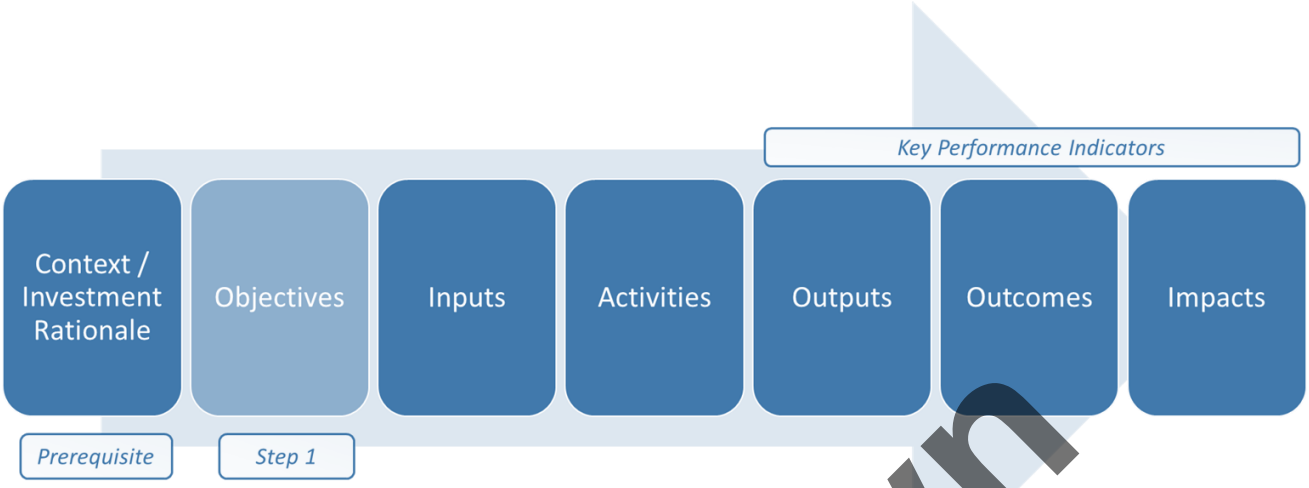

Figure 3.3 Step 1 of LPM Development – Objectives

Useful questions to ask while completing this step include:

- What are the aims of the proposed intervention? Link to the issue(s) being addressed or the policy/policies being supported.
- What is the intervention trying to change and to what extent?
- Are there any sub objectives?
- Have the objectives been prepared with '*SMART*' principles in mind?

3.4 Step 2: Identify the Impacts

The second step of developing a LPM involves identifying the impacts of the intervention. They signify the long-term results and are closely linked to the objectives. Therefore, impacts are related to policy and high-level goals. For example, local or national policies relating to climate change, health, improved safety, and the overall wellbeing of the population.

Note: The 'Impacts' element is situated at the end of the LPM process. However, they should be defined in the second step alongside the project objectives.

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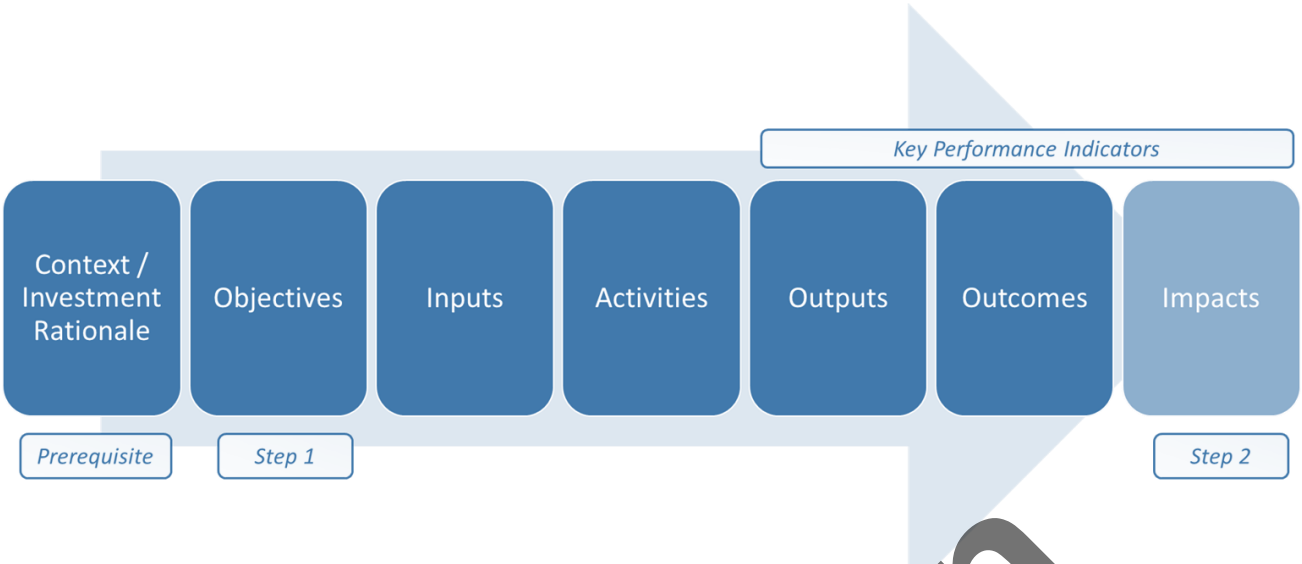

Figure 3.4 Step 2 of LPM Development – Impacts

Useful questions to ask while completing this step include:

- What long-term goals does the intervention hope to achieve? For example, employment impacts, reduced congestion.
- To what extent does the intervention achieve these goals?
- What are the sustainable impacts? For example, those that cause a change in behaviour.
- To what extent does the intervention give effect to environmental sustainability?
- What local or national policy objectives will this intervention support?
- To what extent does the intervention expect to support these policies?

It is important that KPIs are developed in conjunction with identifying the impacts. Further guidance in relation to the setting of KPIs is provided in **Section 3.9.**

3.5 Step 3: Identify the Intermediate Outcomes

The third step of developing a LPM involves outlining the expected outcomes of the intervention. These are the short to medium term changes that must be achieved so that the long-term impacts can be accomplished. It is important when completing this step to link back to the issue for resolution; and the specific communities, policymakers, and specific groups (public transport users, etc.) to be served.

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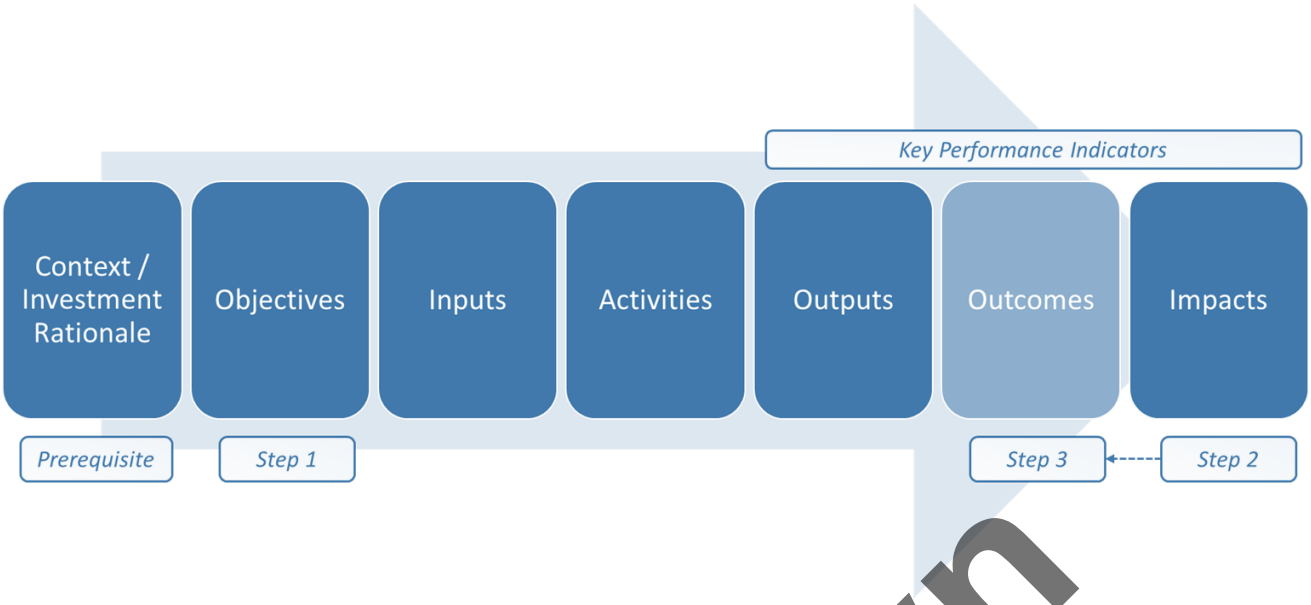

Figure 3.5 Step 3 of LPM Development – Outcomes

Useful questions to ask while completing this step include:

- What short to medium term changes does the intervention hope to accomplish?
- To what extent will the intervention benefit local communities? For example, potential opportunities for modal shift.
- Who will be impacted as a direct result of the intervention? For example, school children, commuters, cyclists, disabled, elderly, women, etc.
- To what extent will the intervention promote accessibility to jobs and services, such as education and health?
- Will the user experience be enhanced by the intervention?

It is important that KPIs are developed in conjunction with identifying the intermediate outcomes. Further guidance to produce useful KPIs are addressed in **Section 3.9.**

3.6 Step 4: Identify the Physical Outputs

The fourth step in the development of a LPM requires the definition of the intervention's outputs. These refer to the direct physical results of the intervention. They are the tangible items required to achieve the outcomes. If the intervention's inputs include capital investment, the output is likely to be the improvement or construction of physical infrastructure. Outputs may also include a new technology, for instance a variable speed limits system. During the early project phases (e.g., Phases 0/1), it is not possible (or expected) to be prescriptive about the type/option of infrastructure or solutions that will be delivered. The known outputs during the early project phases may simply be, for example, enhanced active travel infrastructure in the study area. As the scheme progresses through the phases, the detail in the outputs section will likely become more certain and focussed.

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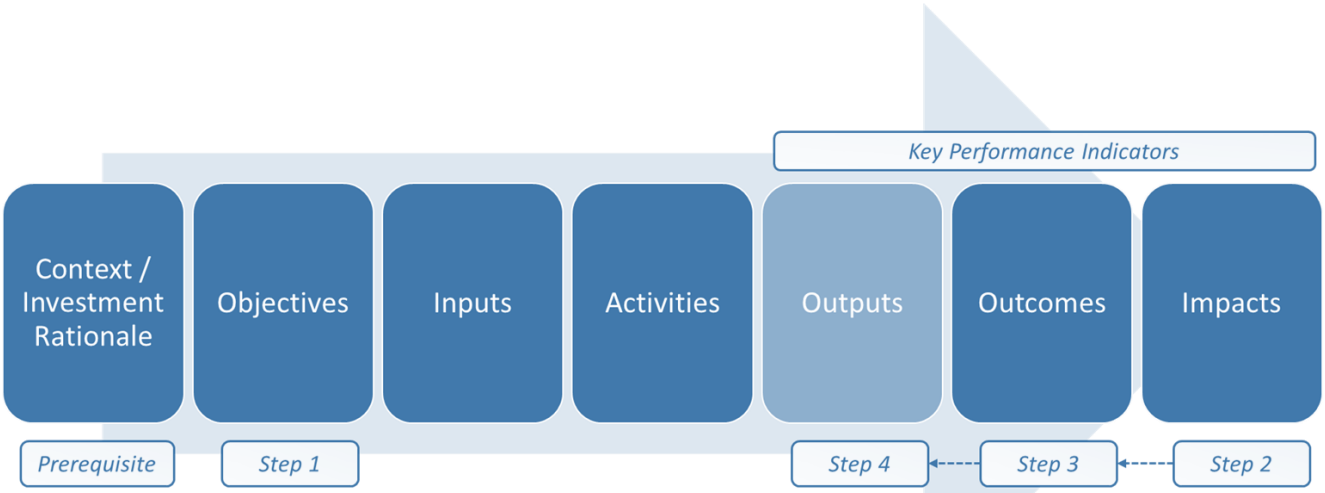

Figure 3.6 Step 4 of LPM Development – Outputs

Useful questions to ask while completing this step include:

- What are the immediate resulting physical / tangible items produced? For example, improved transport facilities, new cycling, pedestrian, road or rail infrastructure, public transport facilities.
- Do the resulting outputs directly address the intervention's objectives? For example, the aim of an intervention may be to create a safe cycling environment in a local community. Therefore, the direct physical outputs could be a new segregated cycling lane, barriers, or signage.

3.7 Step 5: Identify the Activities Required

The fifth step refers to the activities required for the implementation of the intervention. This often entails: determining the actual tasks that will be performed (in terms of quantity, type, and frequency); the number of people or organisations that will carry them out, and what their characteristics are. It may also be important to obtain feedback on the quality of the intervention, for example, from a participant's point of view. (e.g., is the infrastructure provided accessible?).

The activities required to put the intervention into place should be listed clearly. For instance, construction of new cycling infrastructure, the purchasing of equipment, and the delegating of tasks.

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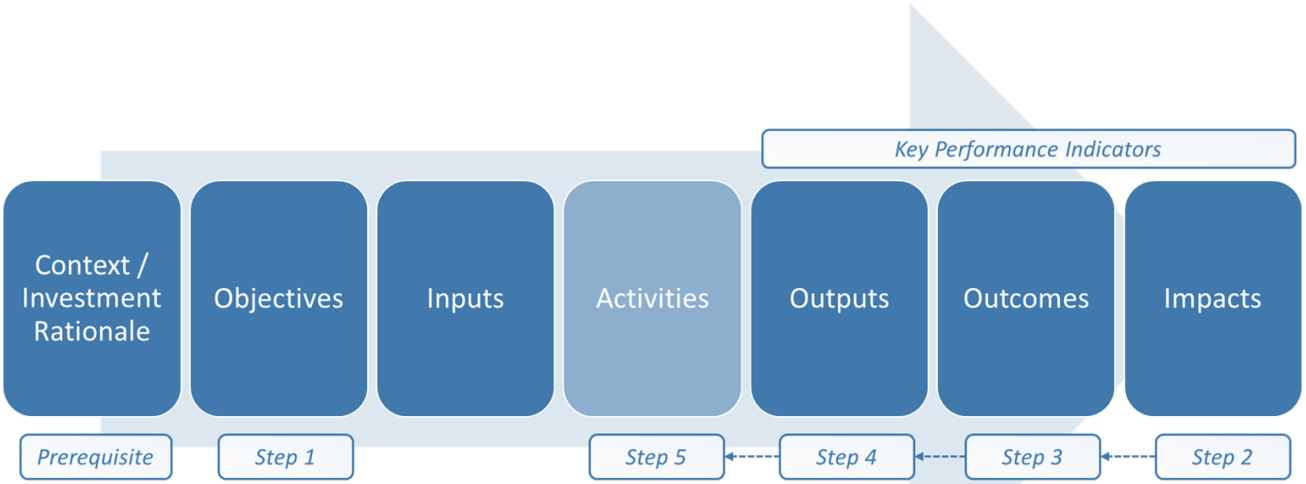

Figure 3.7 Step 5 of LPM Development – Activities

Useful questions to ask while completing this step include:

- What activities will be performed to put the intervention into place? For example, the establishment of new greenway routes, organising campaigns, public consultation, or public support.
  - To what extent will the activities be performed? For instance, prior to the intervention (scoping, surveying), during the intervention (construction), after completion of the intervention (testing). It is important to identify the various activities, as there may be a choice of activities available. For example, a procurement strategy that could be evaluated, and incorporated into the optioneering.
- Who will be required to undertake the various activities? For example, organisations, personnel, stakeholders, or policy makers. This is an early stakeholder identification, that may inform the governance structure for the scheme, with a clearer definition of each stakeholder's role.

3.8 Step 6: Identify the Resources Required (Inputs)

The sixth step of developing a LPM requires listing the set of inputs that are invested as part of the intervention. It is important to be as detailed and specific as possible about each aspect contributing to the intervention. While detailed cost analysis is undertaken in financial appraisal, this section identifies any existing assets that will be utilised (e.g., existing buildings), as well as skills and expertise required, time, and contractors.

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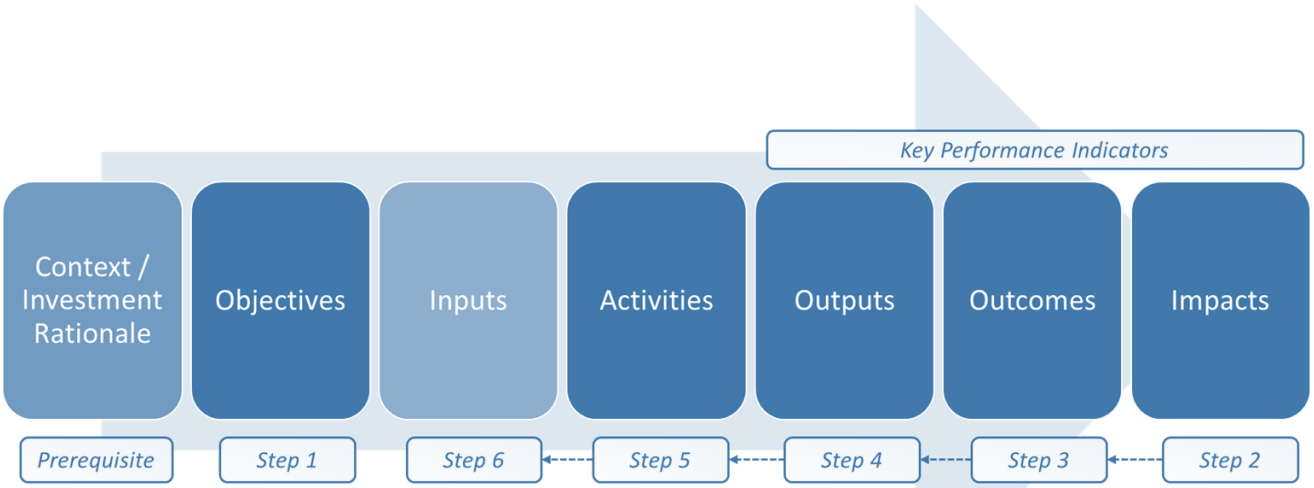

Figure 3.8 Step 6 of LPM Development – Inputs

Useful questions to ask while completing this step include:

- What is required to implement the changes set out by an intervention?
- What additional resources are utilised, for instance, staff time?
- What existing assets will be used? For example, existing buildings.
- Will any new organisational structure be established to undertake the activities, or can they be undertaken in existing organisational structures?

3.9 Define Key Performance Indicators

Overview

Key Performance Indicators (KPI) are the critical quantifiable indicators of progress toward the project's intended results.

KPIs are a means of measuring the performance of the project (both in terms of appraisal of options; and evaluation of the scheme in the future). They should reflect the project specific objectives and provide a realistic and measurable way of evaluating the project. KPIs should also be checked to ensure they align with policy; hence they link to the strategic context of the project. They are important for post project evaluation and can provide valuable insights and lessons learned for future projects.

The KPIs are first developed in the Phase 0 SAR and can be refined in the Phase 1 Feasibility Report and subsequent phases.

How to Implement Key Performance Indicators in a Logic Path Model

KPIs can be divided into benefits and performance indicators for both the appraisal of options and the evaluation of the scheme in the future:

Measuring project **benefits** using KPIs provides the opportunity to quantify the long-term **impacts** and short to medium term **outcomes** resulting from the project implementation. KPIs should be developed in conjunction with the outline of impacts and outcomes and set to measure results in a relevant time frame from project completion.

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For example, if a required outcome of a greenway project is to promote cycling amongst women, then a relevant KPI might be number of women cyclists, compared for base year, year of opening and five years following project completion.

Performance indicators can also be used to assess operational efficiency of the project execution – these relate to how **outputs** are delivered, referring to considerations such as: time, budget, and design delivery against baseline plans. Through assessing the performance, lessons can also be gleaned regarding project management.

When developing KPIs, it is important to define and distinguish between ex-ante (anticipating the outcomes beforehand e.g., through modelling) and ex-post indicators (assessing and evaluating the actual outcomes e.g., through measuring or surveying results). Measurement of a project's performance is possible when sufficient and accurate information is available before and after its implementation. KPIs must therefore also be developed in light of available data and may sometimes require the collection of new data through dedicated surveys.

Useful questions to ask while completing this step include:

- Have we accounted for ex-ante and ex-post measurements?
- What existing models / data do we use to base our evaluations on?
- Are the methods to measure the KPIs financially sound?
- Have we utilised existing relevant data to our best advantage?
- How could we assess if we are 'on track' to accomplishing our goals?

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4. Tips & Insight

There are several different ways to create an effective LPM and certain aspects that should be avoided. Table 4.1 outlines a list of tips and insights that are useful to adopt in the development of a LPM.

Table 4.1 LPM Do's and Don'ts

Do	Don't
✓ Place LPMs at the beginning of SARs in the 'Project Objectives' section	× Place LPMs in the evaluation and monitoring section, often located towards the end of SARs
✓ Develop LPMs in a clear manner to understand their cause-effect relationships by simply defining, listing, or classifying each element (activities, inputs, outputs etc.)	× Construct LPMs to represent a methodological approach
✓ Follow the step-by-step guide and LPM element definitions to develop the correct structure	× Develop an incorrect LPM structure and interchange different LPM elements (e.g., outputs with results)
✓ Separate the requirements of a LPM from other frameworks (e.g., MCA)	× Overlap the requirements of different frameworks
✓ Include KPIs to 'measure' results and impacts ✓ Check that KPIs are aligned with policy goals ✓ Link impacts, outcomes, and outputs back to project objectives	

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