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Project Appraisal Guidelines for National Roads Unit 4.0 - Consideration of Alternatives and Options

PE-PAG-02013
October 2016

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TII Publication Title	<i>Project Appraisal Guidelines for National Roads Unit 4.0 - Consideration of Alternatives and Options</i>
TII Publication Number	<i>PE-PAG-02013</i>

Activity	<i>Planning & Evaluation (PE)</i>	Document Set	<i>Technical</i>
Stream	<i>Project Appraisal Guidelines (PAG)</i>	Publication Date	<i>October 2016</i>
Document Number	<i>02013</i>	Historical Reference	PAG Unit 4.0

TII Publications Website

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1. Introduction

Once the need for an intervention has been established and a set of scheme objectives developed, a process for identifying alternatives and options that address the need for the intervention is required.

This PAG Unit describes the process to be carried out when discussing transport alternatives at Phase 0: Scope and Pre-Appraisal stage and presenting the case for a road based alternative.

Guidance on the identification and appraisal of road based options which fall under TII's remit at Phase 2 Option Selection is also provided within this Unit. This guidance will help to ensure that an appropriate set of options can be developed, refined, and evaluated during the project appraisal process, with the ultimate goal of defining a solution which performs best to achieve the scheme objectives.

1.1 Alternatives

In the context of this PAG Unit an alternative refers to a specific transport mode (road, rail, bus, air etc.) or demand management proposal (fiscal, control, ITS measures etc.) which could address the need for an intervention. The consideration of alternatives has historically been a contentious issue; therefore it is vital that the consideration of alternatives is undertaken and documented at Phase 0: Scope and Pre-Appraisal stage.

1.2 Options

In the context of this PAG Unit, options refer to the specific road based options that fall under the remit of TII. At Phase 2: Option Selection stage a number of options are considered and brought through a structured appraisal process in order to identify a single preferred option.

Table 4.1 summaries the process for considering alternatives and options in relation to the applicable TII Project Phase and Common Appraisal Framework (CAF) stage.

Table 4.1: Process for Considering Alternatives & Options

National Road Project		CAF Stage	Description
Phase	Project Phase Description		
0	Scope and Pre-Appraisal	Stage 1: Preliminary Appraisal	1) Develop the scheme Project Appraisal Plan (PAP) as per the guidance set out in <i>PAG Unit 2.0: Project Appraisal Deliverables</i> . The PAP is used to agree with DTTAS's Economic Financial and Evaluation Unit (EFEU) the assumptions and inputs used in both the preliminary and detailed appraisal of a project. 2) Also in the Project Appraisal Plan present the range of alternatives considered (road, rail, bus, air, demand management etc.) and outline the justification for the exclusion of alternatives. 3) In the Phase 0 Project Brief outline the problems associated with the project (i.e. the need for an intervention). Set out the objectives for the scheme under the six CAF criteria headings as per the guidance set out in <i>PAG Unit 3: Project Brief</i> .
1	Concept and Feasibility		4) Define the Do-Nothing and/or Do-Minimum (Base Case) scenario in the Phase 1 Project Brief.
2	Option Selection		5) Develop a list of options which fall within TII's remit based on the scheme objectives. Identify a reasonable number of options for consideration including Do-Nothing or Do-Minimum and Do-Something Options. Incremental options should also be considered. 6) Evaluation of options leading to the selection of a preferred option.
3	Design and Environmental Evaluation	Stage 2: Detailed Appraisal	7) Detailed evaluation of the preferred option.

2. Consideration of Alternatives

A specific policy (e.g. European directive) or transport strategy may dictate that the preferred alternative to address the need for a specific intervention should be a road based solution and therefore fall under TII's remit. The background to and previous analyses that informed this decision within the policy or strategy should be referenced and documented in the Phase 0 Project Brief.

Where the above is not the case, a range of alternatives should be considered and discussed and the justification for their exclusion outlined in the Phase 0 Project Brief. It's important that a wide range of alternatives are identified and considered, including all modes, infrastructure, regulatory and demand management alternatives.

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3. Principles for Developing Options

Several principles apply when considering options to bring through the Phase 2 Option Selection process. The following principles can be used to evaluate the adequacy of the options proposed for appraisal:

- a) The options must respond to the transportation problems identified in the corridor. In other words, they must address the goals, objectives, and specific transportation problems identified in the Project Brief.
- b) Appraisal should be carried out on an objective basis and not as a 'case-making' exercise. Objective and robust appraisal at this stage will make it easier to complete the planning and implementation stages and minimise the potential for difficulties and risks to arise in the later stages.
- c) The complexity of the appraisal and the methods used will depend on the size and nature of the project and should be proportionate to its scale. The resources to be spent on appraisal should be commensurate with the likely range of cost, the nature of the project and with the degree of complexity of the issues involved.
- d) Options must be significantly different and take account of potential differences in alignment, design standard and junction strategy. Judgment and preliminary analysis are needed to determine whether the possible variations in the definition of an option should be treated as separate options. For example, where two horizontal alignment options are available for a relatively short segment of a particular road scheme, preliminary cost estimates and an environmental review might be useful in determining which alignment should be included in the options (or indeed, if both options should be included). If the alignments are not likely to be significantly different in cost, demand, or environmental effect, they might be treated as simple design variations that can be resolved in preliminary engineering. Alternatively, significant differences in the likely costs and benefits of options would suggest that the alignments should be treated as separate options.
- e) Options should be designed from the start with environmental considerations in mind. Certain environmental designations warrant the avoidance of parks, historic sites, wetlands, floodplains, etc., except under specific conditions. These requirements must be continually considered as candidate alignments are being identified. A detailed analysis that quantifies the impacts and the costs of avoidance or mitigation may be needed before the alignment is adjusted or other refinements are made to minimise adverse impacts. This may not occur until preliminary engineering. Nevertheless, as the options advance from the conceptual stage to the final detailed description in project planning, the relevant environmental issues should be considered in refining the options at a level of detail commensurate with the detail of the options.

4. Consideration of Options

Although the consideration of options is determined largely by local conditions, there are a number of specific options which should be considered:

4.1 Do-Minimum Option (The Base Case)

The Do-Minimum Option provides the baseline for establishing the economic, integration, safety, environmental and accessibility impacts of all options.

It also establishes much of the baseline information needed for the Project Brief and Environmental Impact Assessment, since it examines future year travel demand and its impact on a largely unimproved transportation system. This Do-Minimum Option is referred to as the Base Case within the CAF.

The Do-Minimum Option should include those transportation facilities and services that are committed (see below for a discussion of this) within the appraisal period. All elements of the Do-Minimum Option must be part of each proposed Do-Something Option except where an option replaces services or facilities within the corridor. To provide a basis of comparison the Do-Minimum Option must include the following features:

- The maintenance of existing facilities and services in the study corridor and region;
- The completion and maintenance of committed projects or policies in the study corridor that have successfully completed their environmental review; and
- The continuation of existing transportation policies.

Note that the Do-Minimum is distinct from the Do-Nothing. The Do-Nothing assumes that there will be no other investment in the transport network (other than regular maintenance) during the appraisal period beyond that being considered as part of the scheme under appraisal. It is accepted, however, that in certain circumstances the Do-Minimum may actually be a Do-Nothing scenario.

Committed and Planned Schemes

There are often two possible definitions of complementary projects that should be considered in the appraisal of the scheme in question. Choice among these is determined by the local situation, particularly the degree of certainty that other transportation improvements will be made between now and the horizon year. The possible definitions include:

- (a) "Planned" improvements that are included in the fiscally constrained long-range plan for which the need, commitment, financing, and public and political support are identified and may be reasonably expected to be implemented; and
- (b) "Committed" improvements that have been progressed through planning and are either under construction or are programmed into the capital expenditure budget.

The Do Minimum option should consider "committed" schemes alone as the inclusion of "planned" improvements may lead to a set of scheme options that incorporate projects that may not happen.

Where additional "planned" schemes are proposed within the study area, and where these schemes are likely to impact on scheme appraisal, it may be necessary to undertake a sensitivity test of these complementary proposals. This would involve examining alternative Do-Minimum scenarios, such that

the impact of a changed Do-Minimum on the scheme appraisal can be understood.

4.2 Do-Something Option(s)

At the highest level, a corridor improvement can be delivered through a major investment to widen an existing road, or to develop a new alignment. Typically a number of physical options are possible at this level of investment, and it is common for a number of options to be developed for more detailed studies. This is appropriate given the difference in cost, demand and impact of the range of options.

A Do-Something Option which seeks to utilise the existing asset where feasible through on-line improvements, bottleneck removals, road safety works, traffic management measures or Intelligent Transport Systems must be considered. Given the crucial role of this option (which can be referred to as the Management Option), as both a realistic near-term package of improvements, it deserves significant attention in its definition and refinement. In many respects this option can be the most difficult option to define and develop.

The potential components of a Management Option are many and varied, and tend to be small in scale and widely distributed in location. Most importantly, since the Management Option is designed to represent the “best” that can be done using existing infrastructure, a wide variety of possible interventions may need to be sifted through to identify a package that represents an optimum mix. In more complex locations, this sifting process can lead to several iterations on the definition of the Management Option as components are added and deleted during the appraisal

Ideally, a single Management Option can be agreed upon that represents a comprehensive program of interventions for addressing identified transportation problems. However, there are situations in which more than one Management Option might be necessary and in such circumstances a package of measures or a number of such packages should be considered.

An incremental approach to the development of the Do-Something Options is to be adopted, whereby smaller scale or lower standard investment is initially considered and then incremental increases in scale are assessed. Such incremental investments should then be appraised and the higher level investment accepted if the increment yields net benefits. In this manner, an investment approach, which yields a net benefit close to the optimum, may be established.

5. Summary of Consideration of Options

A summary of the options to be considered as part of the Phase 2: Option Selection process is presented in Table 4.2.

Further guidance on the importance of the consideration of options is provided in the TII Environmental Impact Assessment of National Road Schemes – A Practical Guide - 2008. This guide addresses the requirements of the Environmental Impact Assessment (EIA) Directive, which stipulates that the Environmental Impact Statement (EIS) process must document the main options considered by the decision-makers while choosing the final project design.

The process of options analysis is also referenced in Section 2.5 of the CAF, which requires a process of Option Generation and progressive appraisal, leading to the ultimate definition of a preferred option

Table 4.2: Phase 2 Option Selection Process – Consideration of Options

Scenario	Description	Comment
Do-Minimum (The Base Case)	<p>No investment, other than that committed by other projects and maintenance costs.</p> <p>May include either committed projects or planned projects – although the inclusion of planned projects will suggest reliance of the subject scheme on those projects.</p> <p>In all instances where planned projects are included within the Do-Minimum (The Base Case) a scenario with committed schemes only should be included as part of the appraisal.</p>	<p>If there are no other schemes that will be delivered during the appraisal period that are considered as part of the Do-Minimum, then the Do-Minimum will effectively be a Do-Nothing scenario.</p> <p>The Do-Minimum (or indeed the Do-Nothing) represents a base case against which the proposed scheme will be tested.</p>
Do-Something Options	<p>Development of new on-line and/or off-line upgrades, junction upgrades, bridges, etc.</p> <p>An incremental approach should be adopted when considering options.</p> <p>An option which seeks to maximise the use of the existing asset referred to as a Management Option needs to be included as a Do-Something Option if feasible.</p>	<p>A number of alignment and/or junction options may exist that require a structured appraisal through an Option Selection Process.</p>

6. Phase 2 Option Selection Process

Option Selection is a process which seeks to identify a Preferred Option through a structured appraisal process which can be referred to as a narrowing of options. This process falls under the Stage 1 Preliminary Appraisal process in the CAF.

6.1 Narrowing of Options

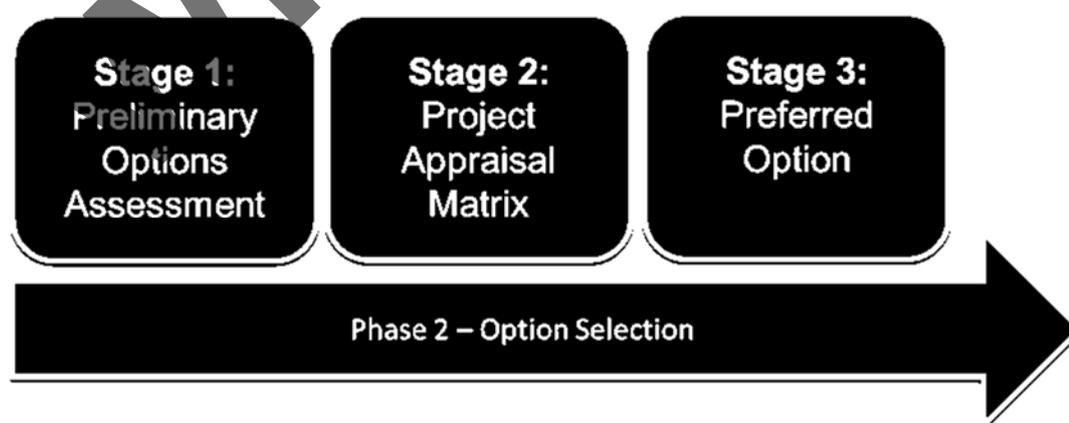
Throughout the planning and project development process the primary nature of the decisions to be made is a selection of the preferred option through a narrowing of options. The Option Selection (Phase 2) process is split into three distinct stages within the TII Project Management Guidelines, each requiring a greater level of assessment and appraisal. The three stages are referred to as:

- Stage 1: Preliminary Options Assessment;
- Stage 2: Project Appraisal Matrix; and
- Stage 3: Selection of a Preferred Option.

Stage 1 - Preliminary Options Assessment - develop a number of feasible options and carry out a Multi-Criteria Analysis (MCA) under the assessment criteria of Engineering, Environment and Economy. This will result in a refined number of options (minimum of 4, Do-Nothing or Do-Minimum and a least 3 Do-Something Options). Further details on MCA are provided in PAG Unit 7.0: Multi-Criteria Analysis.

Stage 2 - Project Appraisal Matrix - following Stage 1, carry out a full CBA and MCA of the quantifiable and non-quantifiable impacts of these options (under the six CAF Criteria of Economy, Safety, Environment, Accessibility & Social Inclusion, Integration and Physical Activity). Further details on MCA are provided in PAG Unit 7.0: Multi-Criteria Analysis.

Stage 3 - Preferred Option - after the completion of Stage 2, select a Preferred Option for the Scheme. Following this, prepare a Project Appraisal Balance Sheet (PABS) to summaries the impact of the Preferred Option.



7. Incremental Analysis

Incremental analysis describes the process by which variations of an option are compared in order to select the preferred solution. Typically, an incremental analysis is undertaken to test the effect of an incremental improvement in a scheme where a higher level of investment may lead to high benefits.

In the appraisal of road schemes, the most relevant role for incremental analysis is in the selection of the carriageway cross-section. Incremental Analysis is generally undertaken during Stage 2 of the Option Selection process in order to confirm the preferred road cross-section prior to the selection of a Preferred Route Corridor. In such cases, all potentially appropriate cross section options should be assessed to inform the selection of the preferred scheme.

Incremental analysis can also be used to ensure the most appropriate junction strategy has been selected for a scheme.

An incremental analysis can be used to compare comparative costs and benefits of alternative carriageway cross-sections. In cases where scheme design is heavily influenced by topographical and environmental constraints and where departures and relaxations in the alignment are required, it is more likely that the design of a different carriageway cross section may require a fundamentally different scheme footprint. In such cases, other carriageway types should be considered within the consideration of options.

The undertaking of an Incremental Analysis is prescribed in the TII Project Management Guidelines which requires that such analysis should be outlined in the Option Selection Report.

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