

Project Appraisal Guidelines

Unit 4.0 Definition of Alternatives

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1 Introduction

- 1.1. The selection of the alternatives to be considered in project planning is perhaps the most important activity in the entire effort. Without a set of alternatives that is structured to isolate the differences between options and to highlight the trade-offs inherent in the selection of a preferred alternative, even the highest quality technical analysis cannot produce the information that is needed by decision-makers.
- 1.2. This guidance describes considerations that are relevant to the definition of alternatives. The guidance does not prescribe any specific set of alternatives, but outlines the range of solutions that should be included when there is a requirement to respond to a specific transportation problem. This will help to ensure the development of an appropriate set of transportation alternatives that can be developed, refined, and evaluated during project appraisal, with the ultimate goal of defining a solution which performs best against the scheme objectives.

2. Development of Alternatives through a Narrowing of Options

- 2.1. Throughout the planning and project development process – from system planning, through corridor planning and preliminary engineering – the primary nature of the decisions to be made is a narrowing of options toward selection of a specific project. In many cases, decision-makers face initial questions on the selection of corridors, then proceed through the selection of general alignment, and finally select a carriageway type and junction strategy.
- 2.2. The planning and project development process is designed around these decisions. It is structured so that the alternatives and the technical work can be focused only on the decision at hand, avoiding unnecessary complication by issues that are relevant only at later stages. This process is outlined in the NRA Project Management Guidelines (PMG) under Phase 2 Route Selection which states:

The purpose of Phase 2 is to identify a suitable Study Area for the examination of alternative routes, to identify key constraints within that Study Area, to develop feasible route options and to carry out a systematic assessment of these options leading to the selection of a Preferred Route Corridor which will form the basis for the detailed design to follow.

- 2.3. The process of alternatives analysis is also referenced in the Section 2.3 of the Dept of Transport Guidelines on a Common Appraisal Framework (CAF) which requires a process of Option Generation and progressive appraisal, leading to the ultimate definition of a preferred option. In both the NRA Project Management Guidelines and the CAF, a staged approach to alternatives analysis is prescribed as set out below.

Table 4.1: Process for Narrowing of Options

Stage	Purpose	CAF Reference	PMG Reference
1	Develop list of alternatives and shortlist based on objectives and scheme requirements – required to identify a reasonable number of options for consideration	Sketch Appraisal	Stage 1: Preliminary Options Assessment
2	Evaluation of alternatives leading to selection of preferred alternative	Preliminary Appraisal	Stage 2: Project Appraisal Matrix
3	More detailed evaluation of preferred alternative	Detailed Appraisal	Stage 3: Project Appraisal Balance Sheet

2.4. Planning tools such as regional travel demand forecasting models support this decision process, and are revised and refined as the scheme progresses through system planning. The approach outlined above recognises the difference between the foregoing of precision and the sacrifice of accuracy in the technical work, so that estimates of costs and impacts, while coarse, are at least approximate indicators of the potential merits of the alternatives. The level of effort is designed so that additional effort will not result in the choice of a different preferred alternative.

3. Requirements of Scheme Alternatives

3.1. Several requirements apply to the definition of alternatives which are to be brought through project planning. The following considerations can be used to evaluate the adequacy of the alternatives proposed for analysis.

- a) The alternatives 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 *Phase 1 Scheme Concept and Feasibility*.
- b) The policy and land-use setting in which the alternatives are defined and analysed must be unbiased and consistent across the alternatives. Since a primary purpose of the project planning analysis is to select one alternative, it is necessary to hold the policy setting constant so that the impacts of the alternatives can be isolated. Similar considerations exist regarding land use policy. If land use assumptions differ among the alternatives, isolating the effect of the alternatives themselves from the impact of the assumed land use changes would be difficult, and would require evaluation of such policy alternatives as part of scheme appraisal. Appropriate sensitivity analyses may be included in the study, if desired, to explore the implications of different service, fare, and/or land use policies.
- c) The alternatives 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 and

reconsidered as candidate alignments and potential station locations 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, and this may not occur until preliminary engineering. Nevertheless, as the alternatives advance from the conceptual stage to the final detailed description in project planning, the relevant environmental issues should be considered in refining the alternatives at a level of detail commensurate with the detail of the alternatives. More detail on the consideration of environmental and other constraints is provided in section 2.5 of the NRA Project Management Guidelines.

- d) The alternatives must be significantly different. Judgment and preliminary analysis are needed to determine whether the possible variations in the definition of an alternative should be treated as separate alternatives. For example, where two horizontal alignment options are available for a relative short segment of a particular road scheme, preliminary cost estimates and an environmental review might be useful in determining which option should be included in the alternatives (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 or as a sketch appraisal. Alternatively, significant differences in likely costs and benefits of alternatives would suggest that the alignments should be treated as separate, major alternatives.
- e) Alternatives should be considered which take account of potential differences in alignment, design standard, junction strategy and travel mode. It is recognised that in the case of some schemes, the decision on travel mode will have been made prior to the definition of alternatives (for example as part of a strategy document). In such cases, these previous analyses should be referenced and documented as part of the appraisal process.

4. Options to be Considered

- 4.1. Although the definition of alternatives is determined largely by local conditions, there are a number of particular options which should be considered:

The Do-Minimum Alternative

- 4.2. The Do-Minimum alternative provides the baseline for establishing the economic, integration, safety, environmental and accessibility impacts of alternatives. 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 Alternative is referred to as the Base Case within the CAF. The Do-Minimum alternative should include those transportation facilities and services that are either committed or planned (see below for a discussion of both these definitions) within the appraisal period. All elements of the Do-Minimum alternative must be part of each alternative except where an alternative replaces services or facilities inside the corridor. To provide a basis of comparison the Do-Minimum alternative 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.
- 4.3. 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.
- 4.4. Within these guidelines, there are two possible definitions of the Do-Minimum option. 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) An alternative that incorporates “planned” improvements that are included in the fiscally constrained long-range plan for which need, commitment, financing, and public and political support are identified and may reasonably be expected to be implemented; and
 - b) A more conservative definition that adds only “committed” improvements – typically those that have been progressed through planning and are either under construction or are programmed into the capital expenditure budget. Note, however, that the adoption of other yet to be completed projects in the Do-Minimum may suggest a reliance of the scheme under consideration on those other projects. This may dictate the requirement for a sensitivity test to understand the impact of non-completion of other projects on the scheme appraisal.
- 4.5. The first definition is the typical definition of the Do-Minimum alternative, but it does entail some risk in that the inclusion of “planned” improvements may lead to a set of alternatives that incorporate projects that may not happen. The second option recognises whatever improvements are essentially certain to occur because they are simply incremental responses to growth in the corridor and have been programmed by the region.
- 4.6. Where significant uncertainty exists in relation to the Do-Minimum, and where such a definition is likely to impact on scheme appraisal, it may be necessary to undertake a sensitivity test of the scheme which examines alternative Do-Minimum scenarios, such that the impact of a changed Do-Minimum on the scheme appraisal can be understood.

The Traffic Management Alternative(s)

- 4.7. Traffic Management (TM) alternatives represent those which seek to respond to transportation problems by maximising the value of existing infrastructure. The TM alternatives can include:
- Removal of bottlenecks through targeted local investment;

- Local road safety improvements;
- Fiscal or Traffic Control measures to manage traffic demand;
- Public Transport Priority, capacity and/or public transport services;
- Corridor or area-wide improvements to pedestrian or cycling provision; and
- Intelligent Transport Systems to improve reliability, safety and operating capacity.

4.8. Given the crucial role of the TM alternative as both a realistic near-term package of improvements, it deserves significant attention in its definition and refinement. In many respects, the TM alternative can be the most difficult alternative to define and develop. The potential components of the alternative are many and varied, and tend to be small in scale and widely distributed in location. Most importantly, since the TM alternative is designed to represent the “best” that can be done using existing infrastructure, a wide variety of possible actions may need to be sifted to identify a package that approximates an optimum mix. In more complex locations, this sifting can lead to several iterations on the definition of the TM alternative as components are added and deleted during the appraisal.

4.9. Section 2.3.5 of the CAF refers to a Management Option as follows:

Investment options will not always represent the most appropriate response to identified needs or objectives. Better management or pricing of existing networks and services may either reduce demand or expand the effective capacity of networks. A management option may also be more environmentally acceptable. Project analysts should give explicit consideration to the management approach when developing options.

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

Major Scheme Investment Alternative(s)

4.11. 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 alternatives 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 alignment options. The development of the Major Scheme Alternatives is outlined in detail in the NRA Project Management Guidelines.

Options Falling Outside the Remit of the NRA

4.12. Section 2.7 of the Dept of Transport Guidelines on a Common Appraisal Framework states:

There are two circumstances in which consideration of options falling outside an Agency’s remit might arise. In the first instance, a preliminary

appraisal or planning process may already have occurred that has considered a large range of options, including modal options outside the Agency's remit. If, out of this process, a smaller range of options has emerged, and all of these lie within the remit of the Agency, then no further consideration of other options outside the remit of the Agency is required. This may occur, for example, where overall transportation planning has resulted in a programme of projects for each of the major modes. Appraisal of the projects within any modal programme (say, the National Roads Programme) may then occur without reference to other modal options. (However, cross modal impacts may need to be addressed.)

On the other hand, if the above process has not taken place, then where an Agency considers that options outside the remit of the Agency could achieve the purpose for which the investment is attended, then that Agency should refer to the Department of Transport for guidance as to how to proceed.

In those cases where the above circumstances might arise then the Strategic Planning Unit should be consulted.

5. Incremental Analysis

- 5.1. Incremental Analysis describes the process by which two variations on an alternative are compared in order to select the preferred solution. Typically, an Incremental Analysis is undertaken to test the effect of an incremental increase in scheme where a higher level of investment will lead to high benefits. In such cases, both alternatives should be assessed to inform the selection of the preferred scheme.
- 5.2. In the appraisal of road schemes, the most relevant role for incremental analysis is in the selection of the carriageway type. Although carriageway types are suggested in the DMRB based on AADT, these should be treated as guidelines, and not as a definitive means of selecting carriageway type.
- 5.3. An Incremental Analysis can be used to compare comparative costs and benefits of alternative carriageway types. 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 alternative carriageway types may require a fundamentally different scheme footprint. In such cases, alternative carriageway types should be considered within the definition of alternatives.
- 5.4. The definition of incremental options is covered under section 2.3.6 of the Dept of Transport Guidelines on a Common Appraisal Framework. The undertaking of an Incremental Analysis is also prescribed in Appendix A2.5 of the NRA Project Management Guidelines which requires that such analysis should be outlined in Section 3 of the Route Selection Report.

6. Conclusion

6.1. A summary of the issues to be considered in the Definition of Alternatives and the role of the Incremental Analysis is outlined below in Table 4-2.

Table 4.2: Options to be Considered in the Definition of Alternatives

Option	Description	Comment
Do-Minimum	No investment, other than that committed by other projects and maintenance costs. May include either committed projects or planned projects – although the inclusion of planned projects will suggest reliance of the subject scheme on those projects.	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. The Do-Minimum (or indeed the Do-Nothing) represents a base case against which the proposed scheme will be tested.
Traffic Management Alternative	Investments which seek to maximise use of existing infrastructure through bottleneck improvements, road safety works, fiscal or control measures, Intelligent Transport Systems or investment in other modes.	Referred to as the Management Option in the CAF.
Major Scheme Investment Alternative	Development of a new road using a combination of on-line and/or off-line upgrades.	A number of alignment and junction options may exist. Requires Incremental Analysis to define design standards.