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## TII Publications



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# Project Appraisal Guidelines for National Roads Unit 7.0 - Multi Criteria Analysis

PE-PAG-02031  
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Withdrawn

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## TII Publications



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# 1. Multi-Criteria Analysis

## 1.1 Introduction

Multi-criteria analysis (MCA) establishes preferences between options by reference to an explicit set of objectives that the decision making body has identified, and for which it has established measurable criteria to assess the extent to which the objectives have been achieved.

MCA techniques can be used across a wide range of decision types such as to identify a single most preferred option, to rank options, to short-list a limited number of options for subsequent detailed appraisal, or simply to distinguish acceptable from unacceptable possibilities. Indeed, CAF identifies that MCA is particularly useful when it can offer quick and cost effective way of short listing projects and comparing them against strategic objectives in a structured way.

CAF identifies that for all projects greater than €5m and below €20m as a minimum an MCA should be carried out. For project greater than €20m MCA is complementary to the other monetary techniques.

Multi-Criteria Analysis (MCA) as an appraisal tool is used during the Phase 2 Option Selection process to evaluate and rank project options against a set of criteria on the basis of a scoring procedure. MCA is also used as a method to develop the Project Appraisal Balance Sheet (PABS) as part of subsequent Project Phases. The criteria reflect policy, programme or project specific objectives but other considerations can be introduced as required. Unlike Cost-Benefit Analysis (CBA), monetised scores are not obligatory and can be expressed in qualitative terms.

National Road projects which cost more than €5 million require an appraisal process which includes a MCA. Projects with costs lower than this amount follow a different appraisal process as set out in PAG Unit 2.0.

MCA can be used to complement monetised appraisal techniques (e.g. CBA) and is used when there are impacts which cannot be assessed using typical financial values (e.g. social impacts). In these cases, MCA provides a framework to evaluate different transport options in relation to a series of consistent assessment criteria.

All criteria should be assessed qualitatively but where possible, each criterion should be assessed both quantitatively and qualitatively.

## 2. Conducting Multi-Criteria Analysis (Steps 1-6)

The following section provides guidance on the MCA process which is based on data provided by DTTAS on the MCA process in the Common Appraisal Framework (2016).

### 2.1 Step 1: Establish the Decision-Making Context

The first step of an MCA is to establish the decision-making context. Central to this will be the high level objectives of the Department for Transport Tourism and Sport (DTTAS) and Transport Infrastructure Ireland (TII).

The MCA will require the identification of a number of objectives which align with the CAF criteria (Economy, Safety, Environmental, Accessibility & Social Inclusion, Integration and Physical Activity) as required for the development of the Project Brief, set out in PAG Unit 3.0.

### 2.2 Step 2: Identify the Project Options for Assessment

The second step is to document the range of options to be considered for the project based on the objectives of the scheme. Advice on objective setting can be found in PAG Unit 3.0.

Initially, there will be a wide range of possible options and the MCA process will begin with some preliminary analysis (option sifting) to reduce this number to a short-list. Removing options which are not realistic due to established restrictions (e.g. legal or environmental) can help to avoid the waste of resources on non-feasible options. Care should be taken to ensure options are fundamentally different from each other and mutually independent.

Engagement with stakeholders at this stage will be used to identify the most important options taking cognisance of their ability to achieve the objectives, these options will then become the focus of the MCA process.

### 2.3 Step 3: Define Criteria and Sub-Criteria

The third step is to define the criteria and sub-criteria which represent the measures of performance by which the remaining options will be judged. For Stage 1 of the Phase 2 Option Selection process, i.e. the initial sifting of options, the headline criteria against which options should be assessed are:

- Engineering;
- Environment; and
- Economy.

For Stages 2 & 3 of the Option Selection process, the headline criteria as outlined in the CAF are:

- Economy;
- Safety;
- Environment;
- Accessibility & Social Inclusion;
- Integration; and
- Physical Activity (where applicable, to be agreed at pre-appraisal stage)

Whilst the main CAF criteria apply to all measures of performance an additional criterion, Physical Activity, can be included in the selection process where it is applicable and must be agreed at pre-appraisal stage.

Below the headline criteria, sub-criteria are required against which a more detailed assessment of the scheme options can be undertaken.

## 2.4 Step 4: Establish a Scoring Procedure

A basic MCA will present the decision maker with a performance matrix which will show how each option performs within the assessment criteria. The decision maker will study the matrix and reach a conclusion based on this information, along with supplementary advice from the Appraisal team.

Where possible, the performance matrix for each option should include both quantitative and qualitative assessment. Each impact should be scored based on the seven point scale as below. An integer will be assigned according to the impact level.

- 7 – Major or highly positive;
- 6 – Moderately positive;
- 5 – Minor or slightly positive;
- 4 – Not significant or neutral;
- 3 – Minor or slightly negative;
- 2 – Moderately negative; or
- 1 – Major or highly negative.

## 2.5 Step 5: Examine the Results and Make Recommendations

The ranking of the proposed options gives an indication of how one option performs against the objectives showing their strengths and weaknesses. The high level ranking of options is given by the sum of all the preference scores based on the scoring for each of the main criterion. The preference scores for each of the main criterion is equal to the sum of the scores for each sub criterion which are assessed individually based on the seven point scale outlined above.

The high level ranking of options is intended only to provide a guide to the impact of options and as a record for future reference. It is **not** intended that the sum of each of the individual scores will be used in selecting a preferred option. The overall impact will obviously depend on the strength of individual impacts and it is up to the assessor to weigh up the individual impacts and form a view as to the likely overall impact of the options.

### 3. Appraisal Criteria & Sub-Criteria Guidance

The following sections provide guidance on the criteria and sub-criteria to be included in the Project Appraisal Matrix and brought forward to the Project Appraisal Balance Sheet. Again advice should be sought from TII when developing the sub-criteria.

#### 3.1 Environment

The consideration of environmental impacts as part of the development of road schemes is an area of significant importance. The EIA and Habitats directives (a new EIA directive will come into force in 2017) provides detailed guidance on the areas of environment which require consideration. These directives are supplemented by TII's Environmental Assessment and Construction Guidelines and the EPA Advice Notes for Preparing Environmental Impact Statements (Draft). The appraisal of environmental criteria and sub-criteria at the various project stages, including MCA, should reflect the outputs of the specific assessments undertaken as part of the EIA process. It should be noted that most environmental criteria will require a specialist input.

Given the above, environment is therefore the most detailed of the appraisal criteria. The consideration of environment as part of the project appraisal should include, but not be limited to, all of the information required for each of the following sections of the Project Appraisal Matrix and Project Appraisal Balance Sheet.

##### 3.1.1 Air Quality & Climate

The TII *Guidelines on the Treatment of Air Quality during the Planning and Construction of National Road Schemes (May 2011)* should be referred to in completing the air quality and climate assessment.

Stage 1: Preliminary Options Assessment: For Stage 1 the existing local air quality conditions in relation to nitrogen dioxide and Particulate Matter 10µm (PM<sub>10</sub>) should be described including any non-road sources that may significantly affect air quality. Previous air quality studies and granted planning permissions within the study area should also be considered. This will be a qualitative statement. Sensitive receptors within 50m of the carriageway of each option should be identified and recorded. This will be a quantitative statement.

Stage 2: Project Appraisal Matrix: For Stage 2 there are four elements that should be considered in the route corridor selection. These are as follows:

- a) Changes to baseline air quality conditions (Qualitative)
- b) Calculation of the Index of Overall Change in Exposure (Quantitative)
- c) Calculation of local scale pollutant (NO<sub>2</sub> and PM<sub>10</sub>) concentrations, if relevant (Quantitative)
- d) Consideration of impacts on sensitive ecosystems (Quantitative)

The first quantitative element is the Calculation of the Index of Overall Change in Exposure which allows a comparison of the overall impact of each route option to be carried out and is based on the number of properties within 50m of the carriageway of all road links that will experience a significant change in traffic. The second quantitative element is required if there is limited information about existing air quality near to roads, or there are sensitive receptors within close proximity to one or more route options. Finally, a quantitative assessment is required to calculate nitrogen oxide concentrations and nitrogen deposition rates within designated sites where there would be a 5% change or greater in traffic flows.

Standard CBA Analysis monetises the impact of the project on CO<sub>2</sub> emissions. The outputs of the analysis should be included in the MCA in terms of the Present Value of Benefits (PVB) from this element. The overall PVB from emissions to air should also be expressed as a ratio of the Present Value of Project Costs, this ratio is {PVB (CO<sub>2</sub> Emissions)/PVC}. Where the project results in an increase in emissions over and above the do-minimum, the PVB will be a negative number.

The impact on climate is measured through a number of quantitative statements relating to the amount of carbon dioxide (CO<sub>2</sub>) likely to be produced for both the “Do Minimum” and “Do Something” scenarios.

### 3.1.2 Noise

The TII Guidelines for the Treatment of Noise and Vibration in National Road Schemes, 25<sup>th</sup> October 2004 and the Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes March 2014 should be referred to in completing the noise assessment.

Stage 1: Preliminary Options Assessment: For Stage 1 any receptors deemed to be particularly sensitive to noise and/or vibration should be identified along with characteristics of the prevailing noise climate and opportunities for noise mitigation e.g. as a result of favourable topography. This will be a qualitative statement.

Stage 2: Project Appraisal Matrix: For Stage 2 there are three elements that should be considered in the route corridor selection. These are as follows:

- a) Assessment of Potential Impact based on receptor counts (Quantitative)
- b) Assessment of changes in traffic flow (Quantitative)
- c) Assessment of the likely need for mitigation measures (Qualitative)

The first quantitative element is the determination of the Potential Impact Rating (PIR) of each route option. The second quantitative element is an estimate of the number of receptors in the vicinity of roads where traffic flows are likely to increase or decrease by 25% or more. Within this second statement consideration should also be given to new roads that are introducing traffic flow where none presently exists. Finally, a qualitative statement should be made for each route option considering what opportunities exist for the provision of noise mitigation measures, should they be deemed necessary.

### 3.1.3 Waste

Road schemes have the potential to produce significant amounts of waste where a cut/fill balance cannot be achieved. Disposal of this material can have adverse effects on the environment in terms of transport of material to/from site causing increased vehicle trip with increased air pollution, noise levels along existing roads and also issues with regard to disposal to licensed sites. For the purposes of MCA three quantitative statements need to be provided, two with reference to the quantities of material to be disposed of off-site (suitable and unsuitable material (U1 and U2) as defined in TII Publication CC-SPW-00600 *Specification for Road Works Series 600 Clause 601*) and whether any contaminated land/hazardous material is being left in situ.

### 3.1.4 Biodiversity (Flora and Fauna)

TII have produced an ecological guidance document called Guidelines for Assessment of Ecological Impacts of National Road Schemes (Revision 2, 1st June 2009). The aim of this document is to provide guidance on the assessment of impacts on the natural environment during the planning and design of national road schemes. It elaborates on the references to ecology (habitats, flora and fauna) contained in the National Roads Project Management Guidelines (NRPMG).

National road schemes are large developments that have potential impacts on the natural environment (habitats, flora and fauna, including fisheries) along their entire length. One of the objectives of the planning stages of road schemes is to avoid or reduce the negative impacts of the final route on the natural environment. This is achieved in part through the Environmental Impact Assessment (EIA) process. The aim of MCA is to highlight the number of sites of ecological value affected by the road project. The MCA should consider two aspects, namely, the number of significant negative impacts sites of ecological importance and the number of significant positive impacts sites of ecological importance. The categorisation of impacts should follow the TII Guidelines for Assessment of Ecological Impacts of National Road Schemes (Revision 2, 1st June 2009) from Local Importance (lower value) to sites of International Importance

According to the TII Guidelines for Assessment of Ecological Impacts of National Road Schemes (Revision 2, 1st June 2009) an adverse effect on the integrity of a European site will be expressed as a significant impact on an ecological resource of international importance (this was not necessarily the case with previous revisions of this document). This means that the project proponents have determined that the project will adversely affect the integrity of the site (note that it is the competent authority, An Bord Pleanála will ultimately make this decision) having regard to Articles 6(3) and 6(4) of the Habitats Directive and relevant Irish transposing provisions.

In such a case, the scheme project can only proceed where, inter alia, there is an 'absence of alternative solutions' and 'imperative reasons of overriding public interest' exist. The presence of a significant impact on an ecological resource of international importance will, therefore, operate as a warning flag. Appendix II of the *TII Guidelines for Assessment of Ecological Impacts of National Road Schemes (Revision 2, 1st June 2009)* provides guidance in relation to Appropriate Assessment.

### 3.1.5 Agriculture

The impact on agriculture is one of the most significant impacts of road schemes due to the largely rural nature of green field schemes. The degree to which a new road affects an agricultural property depends on a number of issues such as:

- The type of farm enterprises carried out;
- Farm size;
- Land take;
- The degree of severance with mitigation;
- Viability; and
- Removal of buildings and / or facilities.

### **3.1.6 Non-Agricultural Properties**

All affected properties and types of land classed as commercial, recreational, open space, minerals and public facilities (hospitals, schools, and religious institutions) which are not of an agricultural nature are considered under the heading of Non-Agricultural Properties. The impact assessment criteria adopted in the MCA are adapted from the EPA Guidelines on Information to be contained within Environmental Impact Statements (March 2002).

### **3.1.7 Architectural Heritage**

TII have produced a set of guidelines called the TII Guidelines for the Assessment of Architectural Heritage Impacts of National Road Schemes. The aim of this document is to provide guidance on the assessment of architectural heritage impacts during the planning and design of National Road schemes in Ireland. It specifically outlines the approach to be adopted in the assessment of architectural heritage at the Constraints Study, Route Corridor Selection and Preliminary Design / Environmental Impact Assessment phases. The impact assessment criteria in the MCA are the same as stated in the Guidelines as adapted from the EPA Guidelines on Information to be contained in Environmental Impact Statements (March 2002).

### **3.1.8 Archaeological & Cultural Heritage**

TII have produced a set of guidelines called the Guidelines for the Assessment of Archaeological Impacts of National Road Schemes. The aim of this document is to provide guidance on the assessment of archaeological impacts during the planning and design of National Road schemes in Ireland. It specifically outlines the approach to be adopted in the assessment of archaeology at the Constraints Study, Route Corridor Selection and Preliminary Design / Environmental Impact Assessment phases. The impact assessment criteria in the MCA are the same as stated in the Guidelines as adapted from the EPA Guidelines on Information to be contained in Environmental Impact Statements (March 2002).

### **3.1.9 Landscape & Visual (including light)**

The quantitative statement for landscape and visual requires the types of visual receptors affected by the scheme either in a positive or negative manner from profound negative to profound positive allowing for an imperceptible impact. A second quantitative statement regarding potential impact on the landscape or townscape. The landscape or townscape is divided into four distinct sections; those with International designations e.g. UNESCO, National designations or listings, County designations or listings and those not designated or listed but of significant landscape value. This final section, where there are no official designations, may be considered under a set of standardised TII Landscape and Visual baseline or sensitivity criteria currently under review by TII.

TII are currently developing a set of guidelines with regard to assessing landscape/townscape and visual/visual receptor impact. However in the interim most environmental assessments have a reasonably standardised set of assessment criteria based largely on the EPA Guidelines, GLVIA Guidelines for Landscape and Visual Impact Assessment 3rd addition by the Landscape Institute and the UK DMRB Volume 11. Therefore as all EIA's are required to assess the landscape and visual impact of a scheme on visual receptors and landscape or townscape character, the MCA aims to standardise the impact ratings so that the Appraisal Team can state the nature of visual receptors and baseline sensitivity of each landscapes or townscape within each impact rating.

**Table 7.1.1: TII Landscape and Visual Baseline and Sensitivity Rating Criteria**

Topic	Weighting			
	Low	Medium	High	Very High
<b>LANDSCAPE</b>	<p>A landscape or townscape where the elements are not valued and is therefore not sensitive to change and where change is unlikely to be detrimental.</p> <p>Landscape types to include but not limited to:</p> <ul style="list-style-type: none"> <li>• Industrial landscapes;</li> <li>• Infrastructural landscapes including major transport corridors;</li> <li>• Degraded urban townscapes/ streetscapes;</li> <li>• Unmaintained wastelands.</li> </ul>	<p>A landscape or townscape that exhibits positive characters is locally important and whose character, landuse, pattern and scale would have the capacity to accommodate change.</p> <p>A landscape or townscape feature with significant merit or character that creates a sense of place – walls, structures, fountains, entrances, boundaries, sculptures and landmarks.</p> <p>Landscape types to include but not limited to:</p> <ul style="list-style-type: none"> <li>• Residential landscapes with established garden planting;</li> <li>• Roadside Open Spaces including semi-private residential spaces and local parks/sports grounds;</li> <li>• Road corridors with substantial street tree planting;</li> <li>• Intact urban townscapes and core urban villages;</li> <li>• Agricultural lands.</li> </ul>	<p>A landscape or townscape widely acknowledged as containing elements of national importance. National designation may apply.</p> <p>A landscape containing features of ecological, historical, sociocultural or national importance.</p> <p>A landscape acknowledged for its quality and value having few negative elements.</p> <p>A landscape having the capacity to accommodate change to a certain degree.</p> <p>Landscape types to include but not limited to:</p> <ul style="list-style-type: none"> <li>• Historical city centre;</li> <li>• Urban centre open spaces and plazas;</li> <li>• Significant urban specimen trees and tree groups including those with tree preservation orders;</li> <li>• District or regional parks and historic landscape or parkland;</li> <li>• Greenbelt areas as defined in the Local Development Plan.</li> </ul>	<p>A landscape or townscape protected by an international or national designation (Special Area Amenity Order (SAAO), candidate Special Area of Conservation (cSAC), proposed Natural Heritage Area (pNHA), etc.).</p> <p>A landscape widely acknowledged for its distinctive features and the quality and value of its elements and edge condition.</p> <p>A landscape with distinctive character and low capacity to accommodate change.</p> <p>Absence of negative elements, e.g. traffic, noise, dereliction, unmanaged areas, etc.</p> <p>Landscape types to include but not limited to:</p> <ul style="list-style-type: none"> <li>• Historical townscapes and urban set pieces;</li> <li>• Nationally important open spaces and parkland.</li> </ul>

Topic	Weighting			
	Low	Medium	High	Very High
<b>VISUAL</b>	<p>Viewers with a passive or temporary view of the landscape such as motorists.</p> <p>Viewers with a passing interest in their surroundings or whose interest is not specifically focused on the landscape.</p> <p>Viewers within an exclusively trafficked landscape (i.e. a major roadway or adjacent to one with no mitigation).</p>	<p>Viewers with a moderate interest in their environment such as recreational travellers and less frequent users of recreational facilities who are likely to experience the type of change resulting from the route options as an adverse (or positive) change in their view and/or the quality of the existing view, as likely to be perceived by the viewer, is assessed as being medium.</p> <p>Viewers within a landscape dominated by traffic. Visual condition of the landscape is degraded.</p>	<p>Viewers with a proprietary interest and prolonged viewing opportunities such as residents and frequent commuters or recreational users who are likely to experience the type of change resulting from the route options as an adverse (or positive) change in their view and/or the quality of the existing view, as likely to be perceived by the viewer, is assessed as being high.</p> <p>Some visual discordance in landscape. Traffic movements distracting visually but not predominant.</p>	<p>Views from high usage public spaces.</p> <p>Areas containing protected views as outlined in the relevant development plans.</p> <p>Viewers with a profound interest in the view such as direct observers (e.g. from a restaurant, local park), views from local residential properties and residential care units with direct views to the route options.</p> <p>Views from areas of recognised high visual value due to architectural or landscape merit, e.g. Georgian Streets or Squares, major tourist attractions.</p>

Withdrawal

### **3.1.10 Soils and Geology**

The TII Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes aim to provide guidance on the assessment of geological, hydrological and hydrogeological impacts during the planning and design of National Road schemes in Ireland. It expands on references to soil and water contained in the NRPMG's and specifically outlines the approach to be adopted in the consideration and treatment of geology, hydrology and hydrogeology at the Constraints Study, Route Corridor Selection and Preliminary Design/Environmental Impact Assessment phases. All construction projects, including national road schemes, are constructed in, or on, the geological environment. Road schemes have the potential to impact geological resources, geological heritage sites and areas dependent on geology for their functions. The impact assessment criteria in the MCA are the same as stated in the aforementioned Guidelines.

### **3.1.11 Hydrology**

The TII Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes is also the basis for measuring hydrology impact in the MCA. It expands on references to soil and water contained in the NRPMG's and specifically outlines the approach to be adopted in the consideration and treatment of geology, hydrology and hydrogeology at the Constraints Study, Route Corridor Selection and Preliminary Design / Environmental Impact Assessment phases. Road schemes have the potential to significantly affect surface water bodies such as rivers, lakes/ponds, estuaries and reservoirs. In particular construction of a road scheme may affect the flood response of a catchment or alter the established drainage pattern. The impact assessment criteria in the MCA are the same as stated in the TII Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes.

### **3.1.12 Hydrogeology**

The TII Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes gives references to soil and water contained in the NRPMG and specifically outlines the approach to be adopted in the consideration and treatment of geology, hydrology and hydrogeology at the Constraints Study, Route Corridor Selection and Preliminary Design / Environmental Impact Assessment phases. Road schemes have the potential to impact groundwater bodies and aquifers. The impact assessment criteria in the MCA are the same as stated in the TII Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes.

## **3.2 Safety**

Two principal road safety impacts are considered through the appraisal process: collision reduction and security of road users.

A large proportion of TII National Road schemes will aim to deliver road safety benefits, the most significant impact being collision reduction. Road safety costs and benefits of the scheme should be apparent based on the traffic modelling and economic analysis completed throughout project planning and design.

The key element of road safety impact to be taken into account through the MCA is the collision related Present Value of Benefits (PVB). The PVB relating to the collision reduction for each option should be recorded and each option ranked on a scale from Highly Positive to Highly Negative.

In addition to the economic impacts of collision reduction, the MCA also takes into account the security impacts of the proposed scheme. The security objective is concerned with improving the personal security of travellers and their property. Security should also take into account the security of vulnerable road users, such as pedestrians and cyclists. For example, schemes providing segregated infrastructure to cater for the needs of pedestrians and cyclists should be ranked highly.

### 3.3 Physical Activity

Summary of nature of physical activity impacts including impacts on particular groups of road users such as pedestrians and cyclists. Examples of where the assessment of these impacts may be required include road schemes which provide new cycling facilities or where enhancements to existing pedestrian and/or cyclist facilities are included as part of a road scheme. Further information on the assessment and quantification of these impacts is provided in PAG Unit 13.0. Where possible, this will include a quantification of benefits in the areas of absenteeism, ambience and health risk reduction derived from using different transport modes.

### 3.4 Economy

The measurement of economic impacts within the MCA aims to determine the relative welfare gain from implementation of the proposed project/scheme. At the Preliminary Business Case Stage, high level cost estimates will be available, whilst at the Detailed Business Case Stage of project delivery, more detailed costings for the preferred option will be available and economic analysis will be completed. The appraisal of economic impacts therefore utilises a summary of both qualitative and quantitative data from these assessments. Further information on the level of economic assessment required, based on the category of the scheme (Major or Minor) is set out PAG Unit 2.0. Three elements are proposed as outlined in the following sections.

#### 3.4.1 Transport Efficiency and Effectiveness

Economic efficiency and effectiveness is measured by the willingness-to-pay of the consumer, the financial impact on transport providers and the effects on government finance. These factors are generally captured through Cost Benefit Analysis (CBA). CBA analyses how projects could increase overall welfare, after allowing for economic costs. If Benefits exceed Costs, or if the Benefits/Costs ratio greatly exceeds 1, then the project should add to overall welfare of society.

The key measure of Efficiency and Effectiveness to be used in the MCA is the transport user related Present Value of Benefits (PVB). The monetised benefits relating to the economy, safety and environment impacts of the scheme are included separately within their respective headings within the MCA however they are combined as part of the overall economic assessment to identify the overall Benefit to Cost Ratio (BCR). The PVB relating to the transport user benefits for each option should be recorded and each option ranked on a scale from Highly Positive to Highly Negative.

#### 3.4.2 Wider Economic Impacts

The transport user benefits do not capture all of the potential economic benefits of a project. The MCA therefore includes additional questions to identify and score any wider economic benefits of a project. As discussed below, these wider economic impacts may only arise in a minority of projects. A project which does not provide these wider economic impacts should receive a neutral score on this criterion. If a road project does provide wider economic impacts, this should be considered a Highly or Moderately Positive impact:

- **Competition in the market:** Transport can affect the competitiveness of a market by reducing the cost of accessing markets. In theory improved transport can link two geographic markets that were previously separate. This will increase competition on the enlarged market, as consumers will have a wider choice of suppliers. This will

increase efficiency and consumer welfare. Most road projects will score neutral in this regard but in exceptional circumstances road projects which connect two previously separate goods markets may deliver this benefit. Projects which present these opportunities should be ranked Highly/Moderately Positive;

- **Agglomeration:** Benefits arise when markets or firms derive additional productivity from being closer together. Generally, most projects will have a Neutral impact in terms of agglomeration but projects which reduce travel time between two production centres resulting in an improvement in supply and contracting arrangements should be ranked Highly/Moderately Positive;
- **Inward Investment:** The potential of the proposed project in attracting sustainable inward investment should be considered. Although most projects will rate as Neutral in this regard, it is possible that some projects could harm investment opportunities and would therefore be ranked negatively. In the case of a road scheme which is at the request of an inward investor, a Highly/Moderately Positive ranking should be proposed;
- **Labour Supply:** Better transport links may increase a market's employment catchment. While most projects will score Neutral in this regard, projects which connect two previously separate labour markets should score Highly/Moderately Positive; and
- **Urban Regeneration:** Although a large proportion of road network investment offers indirect urban regeneration benefits, in exceptional circumstances where a project addresses specific regeneration issues the project should be ranked Highly/Moderately Positive.

For further information and guidance, see PAG Unit 6.9: Wider Impacts.

### 3.4.3 Funding Impacts

Where non-exchequer funding is available for the project, this should be recorded in the MCA process. Schemes without non-exchequer funding should be ranked as Neutral and positive scores should be ranked as follows:

- Slightly positive: less than 10% non-exchequer funding;
- Moderately positive: between 10% and 30% non-exchequer funding; and
- Highly positive: over 30% non-exchequer funding.

The potential source of non-exchequer funding for the preferred option should be recorded in Part A of the PABS.

## 3.5 Accessibility and Social Inclusion

Government objectives for reducing social exclusion have been set out in the National Action Plan for Social Inclusion 2007-2016 (NAPSI). The NAPSI strategy aims to reduce, and ideally, eliminate poverty and social exclusion which affects vulnerable groups. The term vulnerable groups can include; vulnerable women, children, young people, older people, people with disabilities, ethnic minorities, lower-income socio-economic groups and identified deprived areas. Data and resource issues can mean that it is not feasible to complete a comprehensive analysis of the impact of transport projects on social inclusion and so two areas; Deprived Geographical Areas and Vulnerable Groups, form the basis of the Accessibility and Social Inclusion impact assessment required within the MCA.

### 3.5.1 Deprived Geographical Areas

Transport investment has a major role in improving access to employment, education, essential services and amenities. Therefore the focus of analysis regarding social inclusion should be to

establish whether the proposal manages to improve accessibility for residents of socially excluded areas. Particular attention should be paid to the areas covered by the:

- **Area Based Childhood Programme**, a cross-departmental initiative to target investment in thirteen areas of, generally urban, disadvantage.
- **Rural Social Scheme**, low-income farming and fishing areas.

In assessing the effect of a transport scheme on deprived geographic areas, the Appraisal Team should consider whether a transport project will improve accessibility to and from areas of disadvantage. For example, transport schemes would be ranked positively if they increased the accessibility of deprived areas, neutral if there was no impact, and negatively if the transport project resulted in adverse impacts. The Appraisal Team should make use of available datasets and GIS/spatial analysis techniques that could be used to assess impacts on accessibility to deprived areas.

### 3.5.2 Vulnerable Groups

To assess the wider impacts of the project in delivering improved accessibility for communities, the Appraisal Team should consider the project impacts for vulnerable groups. In particular, the analysis should focus on whether the project increases access to jobs, key facilities and social opportunities. Emphasis should be placed on the different impacts that occur for people of varying income groups, car ownership levels and mobility or sensory impairment.

Quantification of the impacts should occur if possible. In most circumstances, a road scheme will be neutral with regards to each of the above criteria, however in exceptional circumstances; new road infrastructure may provide improved access to vital services such as health, education and employment for vulnerable groups. These schemes should be positively ranked within the MCA.

## 3.6 Integration

The integration element aims to ensure planning for transport infrastructure takes account of other elements of Government policy and infrastructure investment. Four types of transport integration are appraised to ensure that investment across the transportation portfolio is integrated towards achieving a common goal, these are outlined below.

### 3.6.1 Transport Integration

This element addresses the promotion of the integration of transport infrastructure and services by focusing on gaps in the existing network and improving opportunities for interchange between modes. Through the MCA, it is important that the Appraisal Team give consideration to the impact of the project on integrating transport services as well as infrastructure. As such, the MCA should rank the proposed project on its merits in relation to:

- **Connectivity of the strategic road network:** It is important that proposed investment on the National Road network is strategic in the sense that it creates a strong link to the existing network and adds value to it. In this regard, schemes which improve connectivity of the National Road network or satisfy an identified gap in the network should be ranked positively. Similarly, those projects which little or no connectivity to the existing network should be negatively ranked;
- **Connectivity between transport modes:** Improving integration between transport modes and the delivery of more seamless transport connectivity is an important Government objective. TII projects support this objective by improving integration between the road network and other modes. Through the appraisal process, projects which present new opportunities for public transport nodes or corridors

should be positively ranked. Similarly, projects which could result in isolation of public transport services or infrastructure should be negatively ranked;

- **Support for sustainable transport modes:** Planning for road network infrastructure needs to incorporate the needs of non-mechanised modes such as walking and cycling. Projects which improve the connectivity of existing sustainable transport networks should be highly ranked while the possibility of a scheme hindering the development of pedestrian and cycling networks should also be taken into account;
- **Access to other transport infrastructure such as ports and airports:** Access to international ports and airports is of national economic importance and should be reflected in the appraisal of major road schemes. Although many schemes will rank as neutral in this regard, the potential of projects to impact on the capacity of routes serving these nodes should be accounted for in the MCA.

### 3.6.2 Land Use Integration

Clarification of the compatibility between adopted land use objectives and the proposed scheme are investigated through this element. Land use integration impacts to be considered are:

- **Support for Local Development Plan:** The project should be compatible with the aims and objectives of local development planning frameworks. Schemes ranking positively in this regard should form part of the development aspiration for the local area and have already been integrated into a sustainable framework for future development;
- **Strategic connectivity for long distance trips:** Development on the national road network primarily aims to cater for strategic long distance trips. This ensures investment is likely to present greater benefits regionally and nationally. It is preferable therefore that future development of the network responds to regional and national rather than local demand. The impact of the proposed scheme in catering for this demand should be reflected in the MCA. For example, projects which are expected to cater for a high proportion of local traffic should be rated negatively and the reverse for regional and national traffic; and
- **Mitigate risks of urban sprawl:** Urban sprawl is the unplanned and uneven pattern of land use development which can be driven by multitude of processes, including transport, leading to inefficient use of resources. Urban sprawl and the low density development it often supports can put the road network under immense pressure if unchecked. It is important therefore that planning of upgrades and new links to the road network mitigate the potential for development which is likely to adversely impact on the road network. Because it is difficult to ascertain the future implication of road development in relation to urban sprawl, most projects will rank as Neutral. However, in consideration of existing land uses, and the type and location of the proposed scheme, the Appraisal Team may have reason to rank a project negatively in this regard.

### 3.6.3 Geographical Integration

Improving connectivity within Ireland and to other parts of the world is the key objective of national transport policy. Whilst the National Planning Framework (NPF) has superseded the National Spatial Strategy (NSS), it is not yet published and in the interim, three factors that could be considered through the MCA in this regard include: connectivity between Hubs and Gateways to improve integration of rural and local services, connectivity with Northern Ireland and access to links with Europe/rest of the world.

The NSS identifies cities and large towns as 'Gateways' and supporting smaller towns as 'Hubs' in an economic and development framework which realises the need for strong transportation links. While still the overarching planning policy in Ireland, the NSS is expected to be replaced by the NPF at the end of 2016. This 20 year strategy will influence all development when it becomes highest document in the planning hierarchy in the near future. Therefore, the MCA should consider the impact of projects in relation to improving access between Hubs and Gateways, but also have regard to the fact that national planning policy will change once the NPF is concluded.

Improving cross border connectivity is one of the key elements of the NSS and so projects which improve north-south transport links should be given positive recognition in the appraisal process.

The Trans-European Transport Network is the strategic road, rail, air and water transport network which is proposed to serve the whole of Europe, accounting for half of all the goods and passengers transported within the European Union. Because of the economic importance of the network to the whole of the Union, projects affecting it should be highly ranked within the MCA.

### **3.6.4 Other Government Policy Integration: Regional Balance**

The main potential contribution to Government policy from transport investment is in relation to achieving the goals of the NPF. The NPF will set the strategic, national context for all future planning policies and have influence at every development plan level. It is likely that the NPF will continue the focus of the NSS in promoting balanced regional development, which will mean supporting both underutilised and rapidly developing areas in-tandem. Therefore the appraisal process should assess the extent that regional balance is promoted.

The following transport projects should be regarded positively for regional balance:

- Transport investment within or to urban centres from peripheral regions
- Transport investment on links between urban centres
- Transport investment on routes which improve access to international ports and airports

The following transport projects should be regarded as neutral to regional balance:

- Links between the East and peripheral regions which do not improve international access
- Transport projects which will only improve mobility within the East region

In regions where average earnings are particularly low; the direct and indirect incomes arising from projects should be quantified along the amount of employment created. In the minority of cases where regional income will be enhanced, the project should be judged as beneficial.

## 4. Phase 2 - Option Selection

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. Throughout the planning and project development process the primary decision to be made is the selection of a preferred option.

The Phase 2 Option Selection 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.

An overview of the three stages of the Phase 2 Option Selection process is provided in the following sections. Further details of the identification of options are provided in PAG Unit 4.0: Consideration of Alternatives and Options.

**Stage 1 - Preliminary Options Assessment** - Examine all 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).

**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).

**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 summarise the impact of the Preferred Option.

The following sections outline the items that are required for each stage of the assessment process in relation to MCA.

### 4.1 Stage 1 – Preliminary Option Assessment

**Stage 1**, the Preliminary Option Assessment should be carried out on all feasible options which have been developed for the scheme. The assessment will be focused on the criteria of Engineering, Environment and Economy, supported by stakeholder engagement and public consultation. It is important to note that this stage of assessment does not require the appraisal criteria used in **Stage 2**.

Best use should be made of information collected previously and care should be taken to minimise the effort and costs required to assemble new information.

For **Stage 1** analysis of the feasible options, some transport modelling may be required. While the presumption is that complex local area transport models will not be required for Stage 1 assessment, existing transport models should be considered to inform the assessment where sufficiently contemporary in nature and developed to acceptable standards.

A sample Performance matrix is provided in Table 7.1.2. The three headline criteria (Engineering, Environment and Economy) are divided into a range of sub-criteria as suggested by, but not limited to, TII's Project Management Guidelines. Advice should be sought from TII when developing sub-criteria.

**Table 7.1.2: Stage 1 Preliminary Options Assessment Performance matrix**

Criterion	Sub Criteria	Quantitative Assessment	Qualitative Assessment	Score
Engineering	Traffic Assessment & Route Cross-section.			
	Technical Standards (DMRB, Minimum Horizontal Radii, Maximum Vertical Gradients, Relaxations, Departures).			
	Principal Junctions and Interchanges, Access Control and interaction with Existing Road Network.			
	Structures (River, Road & Rail bridges, culverts, underpasses and other structures, clearances and headroom).			
	Geology (underlying ground conditions, sensitive areas / areas of poor ground including karst, caves, peat etc.)			
	Groundwater (aquifers, springs, wells and their vulnerability to major earthworks).			
	Earthworks (Cut and Fill volumes, comparative earthworks balance, maximum depth of cuttings and height of embankments)			
	Road Safety Impact Assessment (Assessment of Route Options).			
	Drainage (carriageway drainage, crossing of watercourses, specific drainage requirements through high vulnerability areas).			
	Construction (Comparative ease of construction and Traffic Management).			
	Comparative Service Conflicts (electricity, telecommunications, gas, broadband, cable TV, water, wastewater etc.).			
	Comparisons on Land & Property (land take, land severance, land use, residential acquisitions, and accommodation works requirements).			

Criterion	Sub Criteria	Quantitative Assessment	Qualitative Assessment	Score
			<b>Engineering Sub-Total Score</b>	
<b>Environment</b>	Human Beings including compatibility with development policy.			
	Flora & Fauna (comparative impact on designated sites/species and other areas of national, regional or local ecological value).			
	Water Quality (comparative impact on watercourses, water supplies and aquatic ecology).			
	Geology & Hydrogeology (comparative impact on vulnerable rocks and soils, aquifers and wells of national, regional or local importance).			
	Air Quality (existing air quality environment and number of sensitive receptors).			
	Noise (identification of sensitive receptors, characteristics of the prevailing noise climate and opportunities for noise mitigation).			
	Landscape & Visual (comparative impact on landscape character, topography, vegetation, natural features, views and obstructions)			
	Material Assets (comparative impact on utilities, properties, quarries, transport and infrastructure, etc.).			
	Agriculture (comparative impact on farm operations, farm types, livestock and other agri-business).			
	Archaeology & Cultural Heritage (comparative impact on Recorded Monuments and Places, areas of archaeological potential, Architectural Heritage, and any other areas of cultural significance as per TII Guidelines for the Assessment of Archaeological Heritage Impacts of National Road Schemes and TII Guidelines for the Assessment of Architectural Heritage Impacts of National Road Schemes).			

Criterion	Sub Criteria	Quantitative Assessment	Qualitative Assessment	Score
			<b>Environmental Sub-Total Score</b>	
<b>Economy</b>	Efficiency and effectiveness			
	Wider economic impacts			
	Transport Quality and Reliability			
	Funding impacts			
			<b>Economy Sub-Total Score</b>	
			<b>Total-Score</b>	

Withdrawn

## 4.2 Stage 2 – Project Appraisal Matrix

**Stage 2** involves the further appraisal of a small number of better performing options in order to obtain sufficient information to enable decision-makers to make a rational and auditable decision about whether or not to proceed with a scheme. The focus of analysis is on estimating the likely performance and impact of interventions against the six CAF appraisal criteria headings

**Stage 2** is typically the longest stage within the overall appraisal process. The collection of sufficient data for the modelling and environmental analysis work and their implementation is substantial at this Stage.

A sample Project Appraisal Matrix is provided in Table 7.1.3. The six CAF criteria headings are divided into a range of sub-criteria which are discussed in greater detail Section 5.0 of this Unit.

The assessment carried out in **Stage 2** will feed into further detailed analysis of a preferred option in **Stage 3**.

Withdrawn

**Table 7.1.3: Stage 2 Project Appraisal Matrix**

Criterion	Sub Criteria	Quantitative Assessment	Qualitative Assessment	Score
Environment	Air Quality and Climate			
	Noise			
	Landscape and Visual (including light)			
	Biodiversity – Flora and Fauna			
	Waste			
	Soils and Geology			
	Hydrology			
	Hydrogeology			
	Architectural Heritage			
	Archaeological and Cultural Heritage			
	Non-agricultural properties			
	Agriculture			
			<b>Environment Sub-Total Score</b>	

Withdrawn

Criterion	Sub Criteria	Quantitative Assessment	Qualitative Assessment	Score
<b>Safety</b>	Collision Reduction			
	Security			
			<b>Safety Sub-Total Score</b>	

Criterion	Sub Criteria	Quantitative Assessment	Qualitative Assessment	Score
<b>Physical Activity</b>	Ambience			
	Absenteeism			
	Reduced Health Risk			
			<b>Physical Activity Sub-Total Score</b>	

Criterion	Sub Criteria	Quantitative Assessment	Qualitative Assessment	Score
<b>Economy</b>	Efficiency and Effectiveness			
	Wider Economic Impacts			
	Transport Quality and Reliability			
	Funding Impacts			
			<b>Economy Sub-Total Score</b>	

Criterion	Sub Criteria	Quantitative Assessment	Qualitative Assessment	Score
<b>Accessibility &amp; Social Inclusion</b>	Deprived Geographical Areas			
	Vulnerable Groups			
			<b>Accessibility &amp; Social Inclusion Sub-Total Score</b>	

Criterion	Sub Criteria	Quantitative Assessment	Qualitative Assessment	Score
<b>Integration</b>	Transport Integration			
	Land use Integration			
	Geographical Integration			
	Other Government Policy Integration			
			<b>Integration Sub-Total Score</b>	
			<b>Total-Score</b>	

### 4.3 Stage 3 – Project Appraisal Balance Sheet

**Stage 3** involves the final detailed appraisal of the preferred scheme option emerging from **Stage 2**. The focus of the analysis is on accurately detailing the likely performance and impact of the preferred scheme option against the six CAF appraisal criteria headings.

The **Stage 3** assessment of the preferred option should be presented in the form of a Project Appraisal Balance Sheet (PABS). **Unit 7.1** provides guidance on the PABS.

**Table 7.1.4 provides an overview of the Phase 2 Option Selection process and applicable MCA assessment.**

PMG Phase 2 Option Selection Stage	CAF Stage	MCA Assessment Criterion	Summary Template
<b>Stage 1 - Preliminary Option Assessment</b>	Preliminary Appraisal	1. Engineering 2. Environment 3. Economy	Performance matrix
<b>Stage 2 - Project Appraisal Matrix</b>		1. Economy 2. Safety 3. Physical Activity	Project Appraisal Matrix
<b>Stage 3 – Selection of a Preferred Option</b>		4. Environment 5. Accessibility & Social Inclusion 6. Integration	Project Appraisal Balance Sheet (PABS)

### 4.4 Stakeholder Engagement - Consultation, Participation and Information

**Stages 1, 2 and 3** should be informed by engagement with stakeholders, tailored to the specific circumstances to ensure the appraisal approach is proportional to the scale and complexity of the intervention. This should include public consultation on appraised options prior to final selection and implementation. The public consultation requirements for each stage of the assessment process are outlined in Section 2 (Option Selection) of TII's Project Management Guidelines.

### 4.5 Costs & Risk

In conducting economic and financial analysis in **Stages 1, 2 and 3**; cost estimates should be developed for scheme options which are in line with the stage of the planning process and the level of design detail available. Appropriate risk contingencies should be applied to various elements contributing to the scheme cost estimates. Advice on developing cost estimates is provided in TII's Cost Management Manual and TII's Cost Estimation Unit should always be consulted.

# Withdrawn



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