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Project Appraisal Guidelines Unit 7.0 – Multi-Criteria Analysis

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**Updates to TII Publications resulting in changes to
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Amendment Details:

This unit has been updated to reflect the TII PMG Phase 0-2 changes introduced as a result of the DoT Transport Appraisal Framework (June 2023) requirements. Unit 7.0 – Multi-Criteria Analysis now aligns with the updated appraisal process and deliverables in Unit 2.1 – Project Outline Document, Unit 3.0 – Feasibility Report and Unit 4.0 – Options Report.

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1. Context

1.1 Introduction to the Multi-Criteria Analysis

PAG Unit 7.0 provides guidance and methods used to conduct Multi-Criteria Analysis (MCA) assessments for TII projects. MCA assessments are required as part of the project appraisal process as part of TII project lifecycle at Phase 1 (Concept & Feasibility) and Phase 2 (Options Selection). This PAG Unit supersedes the previous version of PAG Unit 7.0, which provided guidance solely on the use of MCA in the Phase 2 Option Selection process.

PAG Unit 7.0 will be used by consultants, local authorities and transport practitioners to conduct MCA assessments in line with the Department of Transport (DoT) Transport Appraisal Framework (TAF). The TII PAG translate the DoT TAF requirements specifically for projects under the remit of TII.

The term MCA is used in this PAG Unit to refer to the practice of assessing options against a set of objectives or criteria in order to identify a preferred set of options, or single option. Unit 7.0 includes guidance on conducting Transport and Accessibility Appraisal (TAA) in Phase 2, which was introduced by the DoT TAF as part of the detailed assessment stage of the Option Selection process.

The updated PAG Unit 7.0 guidance is designed to align with the requirements of the National Investment Framework for Transport in Ireland (NIFTI), the Transport Appraisal Guidelines (TAF) and the TII strategy National Roads 2040 (NR2040).

1.2 Overview of Option Selection Process

An overview of the Option Selection process across TII PMG Phases 1 and 2 is provided in Figure 7.0.1. The Option Selection process takes place in a progression which starts with the identification of the most suitable transport modes and intervention types. This then focuses the development of Strategic Options incorporating the particular modes and interventions.

The Strategic Options are assessed in Phase 1 to ensure that they are feasible and meet the project objectives. The refined list of Strategic Options are then developed into Preliminary Options at the start of Phase 2, facilitating detailed appraisal and the selection of a Preferred Option.

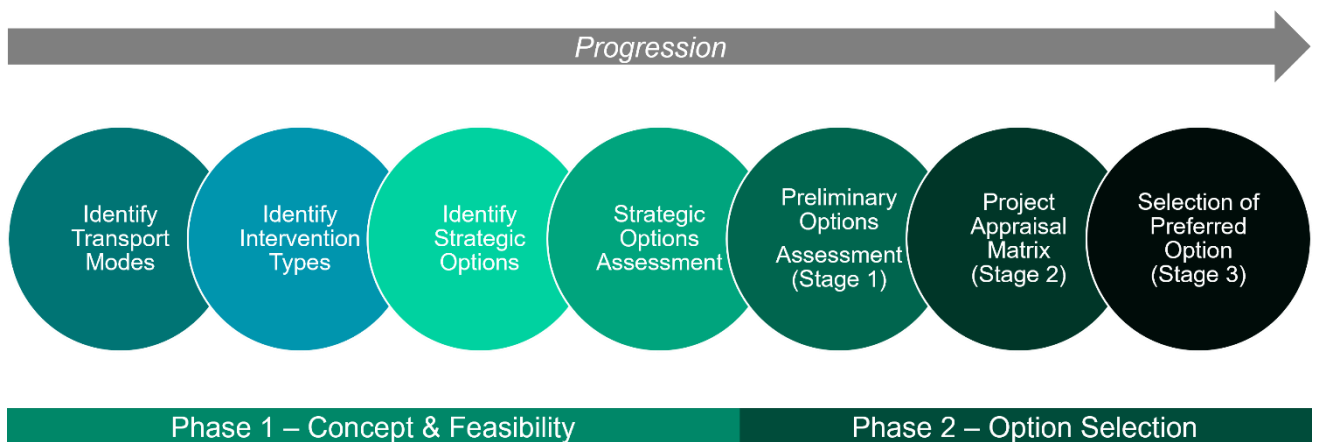


Figure 7.0.1 Option Selection Process in Phase 1 and 2

An MCA is required at Phase 1 as part of the Strategic Options Assessment stage to inform the identification of Strategic Options to take forward to Phase 2 for refinement and further consideration.

At Phase 2, an MCA is undertaken as part of the Preliminary Options Assessment (Stage 1) process to reduce the number of Preliminary Options to take forward for detailed analysis as part of the Project Appraisal Matrix (Stage 2) process. A final MCA is undertaken as part of detailed analysis at Stage 2 to inform the Selection of a Preferred Option (Stage 3).

1.3 Role of Unit

This unit does not provide guidance on how practitioners should score options against specific criteria or sub-criteria, as this is specific to each relevant specialist and the associated guidance for their specialist area.

Instead it provides guidance on the overall structured MCA framework that should be applied to the appraisal of TII projects, identifies the relevant criteria or sub-criteria to be considered and points to the relevant guidance for these criteria.

2. Multi-Criteria Analysis – Scoring Method

2.1 Overview

This section describes how each MCA should be scored as part of the Option Selection process. Table 7.0.1 describes the assessment method and scoring type used in the three different types of MCA in Phase 1 and Phase 2. This section explains the approach for scoring each MCA in more detail.

Table 7.0.1 MCA Assessment and Scoring Methods Summary

Phase	Phase Deliverable	MCA Assessment	MCA Assessment Method	Scoring Method
1	Feasibility Report	Strategic Options Assessment	Project Objectives	3 point colour scale
2	Options Report	Stage 1 - Preliminary Options Assessment	Environment / Engineering/ Economy	7 point score scale
		Stage 2 - Project Appraisal Matrix	TAA using TAF Criteria/Sub-Criteria	7 point score scale

2.2 Phase 1 Strategic Options Assessment MCA

2.2.1 Strategic Options Assessment

Guidance on the appraisal process at Phase 1 (Concept & Feasibility) is provided in PAG Unit 3.0 – Feasibility Report. As part of the appraisal process at Phase 1 an assessment of Strategic Options is required using a two-step approach:

- **Step 1** - the first step in the process is to assess the Strategic Options on the basis of their ability to achieve the Project Objectives (using an MCA assessment)
- **Step 2** – a feasibility assessment of the Strategic Options brought forward from Step 1 is then undertaken

Strategic Options which both align with the Project Objectives and are considered feasible will be taken forward to Phase 2 (Options Selection) for further refinement and consideration as part of the Phase 2 Stage 1 Preliminary Options Assessment¹.

2.2.2 Strategic Options Assessment - MCA

As outlined above the focus of this MCA at Phase 1 is to assess the Strategic Options on the basis of their ability to achieve the project objectives. This initial MCA should draw on the extensive evidence and conclusions presented in the Feasibility Report to assess the Strategic Options, such as; the baseline review, multi-modal demand analysis and the modal/intervention identification work.

¹ Where it's deemed appropriate by practitioners, the feasibility assessment may be undertaken first prior to the assessment against Project Objectives. Regardless of the approach, an MCA assessment of the Strategic Options against the Project Objective must be undertaken.

The MCA should be conducted using a template such as the example presented in Table 7.0.2, with columns added as required for Project Objectives. In the righthand columns, the decision whether to retain or remove the Strategic Option for further consideration should be clearly defined and justified. The written justification should explain the scoring in the MCA columns and justify the decision to retain or remove the option.

The aim of the Strategic Option Assessment at Phase 1 should be to create a concise list of Strategic Options to take forward to Phase 2 for detailed appraisal. It is important that options are not ruled out too early in the appraisal process without due consideration. It is therefore essential that the rationale for the elimination of any Strategic Option is clearly documented.

Table 7.0.2 Example MCA Table for Phase 1 Strategic Option Assessment

Strategic Options	Project Objectives				Proceed to Phase 2?	Justification
	Objective #1	Objective #2	Objective #3	Objective #4		
#1						
#2						
#3						
#4						

2.2.3 Strategic Options Assessment - MCA Scoring

The MCA for Phase 1 Strategic Option Assessment should use a three-point colour scoring explained in Table 7.0.3. The focus of scoring is on the potential for each Strategic Option to achieve the project objective under assessment, to identify the suitable Strategic Options to bring forward to Phase 2.

The MCA options should not be given a numerical value based on the colour scoring and summed, instead a professional judgement should be made on the balance of the impacts across the project objectives and the preferred Strategic Options identified. As outlined in TAF it is acceptable to have a hierarchy of scheme objectives, based on the project need and issues the project is trying to address. This should be taken into consideration when assessing the Strategic Objectives against the Project Objectives. It will be important to provide a written justification to explain the scoring provided for each Strategic Option.

Table 7.0.3 Scoring Method Used in Phase 1 Strategic Options Assessment

Colour Scoring	Score Meaning
	Strategic Option meets the requirements of the project objective
	Strategic Option partially meets the requirements of the project objective
	Strategic Option will not meet the requirements of the project objective

2.3 Phase 2 Preliminary Options Assessment

2.3.1 Overview

At the end of the Phase 1 Feasibility Report, a number of Strategic Options are identified for Phase 2 for further consideration. Strategic Options are high-level options, consisting of modes and intervention types, with broad alignments/design details. In Phase 2, for each Strategic Option, the practitioner should identify the potential alignments/routes or locations for the infrastructure in the Appraisal Study Area e.g. a 'spider's web' approach. The identification of Preliminary Options at the outset of Phase 2 should be informed by the constraints, risk and opportunities study undertaken at Phase 1. The method used to identify these Preliminary Options is flexible and determined by the practitioner in the Appraisal Pathway approach explained at the end of the Phase 1 Feasibility Report.

For larger and more complex projects, a high-level MCA assessment is generally required in order to reduce the overall number of options to bring forward for detailed appraisal (often described as sifting or shortlisting). For example, the 3 E's approach (i.e. Engineering, Environment and Economy assessment) can be used to help refine the number of Preliminary Options to take forward. Regard should be given to all Environmental factors as outlined in the EIA Directive. Alternative bespoke methods can be used if it is better suited to the local context or project requirements.

A manageable number² of Preliminary Options should be taken forward for detailed appraisal as part of Phase 2 Stage 2 Project Appraisal Matrix.

2.3.2 Preliminary Options Assessment MCA

Unless otherwise justified, the Preliminary Options Assessment MCA will be focused on the criteria of Engineering, Environment and Economy, supported by stakeholder engagement and public consultation if this information is available. 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.

² The DoT TAF refers to a minimum of 3 options to be brought forward for detailed appraisal. This should not be treated as a target number for a TII project as each project is unique in its nature and complexity. It is recommended for TII projects that a maximum of 6 options are brought forward, however there is flexibility in this regard.

Table 7.0.4 Example Preliminary Option 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
Engineering Sub-Total Score				
Environment	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).			
Environmental Sub-Total Score				

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

2.3.3 Preliminary Options Assessment - MCA Scoring

A basic MCA will present the decision maker with a performance matrix which will show how each Preliminary 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
- 1 – Major or highly negative

2.4 Phase 2 Detailed Appraisal of Preliminary Options MCA

2.4.1 MCA for Projects Under €30m

For proposals with estimated costs of under €30m, detailed appraisal of the Preliminary Options in Phase 2 should involve an MCA using the seven TAF criteria:

- Economy – Transport User Benefits and Wider Economic Impacts
- Accessibility Impacts
- Social Impacts
- Land Use Impacts
- Safety Impacts
- Climate Change Impacts
- Local Environmental Impacts

TAF notes those conducting the MCA may choose to leave out certain criteria if they are not considered pertinent to the impacts of the scheme although there is an expectation that key impacts relating to the local environment and safety will be relevant to most if not all of TII projects.

The scoring method for the detailed appraisal of preliminary options should be the same as that used for the three E's preliminary option assessment, a seven-point scale:

- 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

- 1 – Major or highly negative

2.4.2 Detailed Appraisal of Preliminary Options – TAA for Projects Over €30m

The following sections outline the steps required to conduct a TAA assessment of Preliminary Options. The TAA replaces the detailed MCA evaluation of Preliminary Options for schemes with estimated costs of €30m or more and is designed to complement quantitative appraisal approaches such as CBA. A TAA template is available from the DoT which can be adjusted to reflect the appraisal needs of a scheme³.

2.4.2.1 Purpose of TAA and Conducting the Assessment

TAF outlines six main criteria are to be used in the detailed qualitative appraisal of the selected Preliminary Options:

- Accessibility
- Social
- Land Use
- Safety
- Climate Change
- Local Environment

For each of the TAA criteria, there are several sub-criteria and indicators which Preliminary Options need to be assessed under. Indicators refer to specific impacts that should be assessed under a sub-criterion. Similar to MCA, TAF allows for criteria or sub-criteria that are not relevant to the scheme to be excluded from the TAA assessment of the Preliminary Options through a screening process.

The exclusion of headline criteria or specific sub-criteria should be agreed as part of the Phase 0 Project Outline Document at the outset of a scheme's development. There is also the possibility to include additional sub-criteria under the main TAA criteria that are relevant to the proposed scheme. The inclusion of any additional sub-criteria should be agreed in advance.

2.4.2.2 Scoring Method – Transport Accessibility Appraisal

Similar to the MCA, the TAA will present a decision-maker with a performance matrix which will show how each option performs against the selected TAA criteria and sub-criteria. The qualitative scores which should be used for the scoring of options under the TAA criteria and sub-criteria are as follows:

- 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
- 1 – Major or highly negative

TAA requires supporting data and analysis to inform the scoring of indicators and their respective sub-criteria which informs the main TAA criterion score for an option.

³ DoT TAA Template: <https://assets.gov.ie/260312/211d704f-7e1c-49a7-bf2b-2d0d6c6b4f5f.xlsx>

The results and outputs of supporting analysis and data should be presented as part of the discussion of TAA results for the different preliminary options which are subject to detailed appraisal.

2.4.2.3 Economic Appraisal Relationship with TAA

TAA excludes the Transport User Benefits and Other Economic Impacts criteria. Instead, this is assessed using CBA or CEA, which are explained further in this section.

2.4.2.3.1 Cost-Benefit Analysis (CBA)

Cost-Benefit Analysis (CBA) identifies and monetises certain social and economic benefits of a project. The CBA is designed to accompany the TAA assessment, which focuses on the non-monetisable impacts of an option under consideration. The TAA should be prepared first for the Preliminary Options, with the CBA performed second to monetise the impacts across the different options and consider the results in combination. Further details on conducting a CBA are provided in PAG Unit 6.1 - Guidance on Conducting CBA.

2.4.2.3.2 Cost Effectiveness Analysis (CEA)

Cost Effectiveness Analysis (CEA) should be performed on the options where the monetisation of impacts/benefits is not possible, after the TAA is completed. Key Performance Indicators (KPI) should be used in the CEA that relate to the primary objectives of the scheme (e.g. number of expected transport users, collision reduction). This KPI should then be divided by the scheme cost estimate of each option to achieve a CEA score. The CEA is conducted to evaluate the value for money across the Preliminary Options which cannot be assessed in CBA.

2.4.2.4 Presentation of TAA Results

The results from the TAA should be presented alongside the CBA or CEA for the Preliminary Option. The recommendation regarding a preferred option for the scheme should consider the results from the various appraisal including the financial appraisal results.

Table 7.0.5 Example TAA Appraisal Results

Option	Accessibility	Social	Land Use	Safety	Climate Change	Local Environment	MCA Scores	CEA Scores	CBA Scores (BCR)
1	Highly positive	Negative	Low Negative	Negative	Low Negative	Negative			
2	Positive	Highly Negative	Low Positive	Highly Negative	Negative	Neutral			
3	Low Positive	Neutral	Positive	Negative	Neutral	Low Positive			
4	Neutral	Low Negative	Positive	Negative	Low Negative	Positive			

3. MCA Appraisal Criteria & Sub-Criteria Guidance

3.1 Overview

The following section outlines the criteria and sub-criteria to be used in an MCA used for detailed appraisal of preliminary options. Advice should be sought from TII when developing the sub-criteria that are not featured in the following sections. Further detail on the criteria and the measurement of respective impacts can be found in TAF Module 7 and the other relevant guidance listed.

Care should be taken when to avoid double counting selecting sub-criteria and assigning MCA scores. Some criteria and sub-criteria are liable to be assessed in a similar manner and may lead to double counting of the potential impact of an option. For example, accessibility impacts for socio-economically disadvantaged groups could be assessed under the accessibility criterion although there is a specific sub-criterion under the social impact criterion for this purpose.

3.2 Environmental Impacts

TAF requires environmental impacts to be assessed across two main criteria:

- Climate Change Impacts
- Local Environmental Impacts

The consideration of environmental impacts as part of the development of TII schemes is an area of significant importance. 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.

3.3 Climate Change Impacts

Assessing climate change impacts as part of an MCA will involve the use of both qualitative and quantitative inputs. Use should be made of previously conducted emissions studies that relate to the proposed scheme. It is expected that the impact on climate will be measured through a number of quantitative statements relating to the amount of carbon dioxide (CO₂) and CO₂ equivalent emissions likely to be produced for both the “Do Minimum” and “Do Something” scenarios. Relevant sub-criteria and appraisal considerations are presented in Table 7.0.6.

Table 7.0.6 Climate Change Criteria & Guidance

Sub-Criteria	Appraisal Considerations	Relevant Guidance to Consider
Climate Action Impacts	<ul style="list-style-type: none"> • Change in greenhouse gas emissions associated with an option. • Change in CO₂ equivalent emissions associated with an option. 	<ul style="list-style-type: none"> • PE-ENV-01104 - Climate Guidance for National Roads, Light Rail, and Rural Cycleways (Offline & Greenways) - Overarching Technical Document • PE-ENV-01105 - Climate Assessment of Proposed National Roads – Standard • GE-ENV-01107 - TII Road Emissions Model (REM): Model Development Report

Sub-Criteria	Appraisal Considerations	Relevant Guidance to Consider
		<ul style="list-style-type: none"> GE-ENV-01106 Transport Infrastructure Ireland Carbon Tool for Road and Light Rail Projects: User Guidance Document
Climate Adaption	<ul style="list-style-type: none"> Option contribution towards providing a climate robust and resilient transport network 	<ul style="list-style-type: none"> PE-ENV-01105 Climate Assessment of Proposed National Roads - Standard

3.4 Local Environmental Impacts

A scheme may have a wide range of environmental impacts beyond impacts relating to climate. These environmental impacts are more likely to be localised to the study area of the scheme and need to be assessed as part of an Environmental Impact Assessment. For accurate assessment of options under sub-criteria presented in Table 7.0.7, a mix of quantitative and qualitative approaches will be required.

Table 7.0.7 Local Environmental Criteria & Guidance

Sub-Criteria	Appraisal Considerations	Relevant Guidance to Consider
Agricultural Impacts	<ul style="list-style-type: none"> Level of likely severance for farm holdings Farm viability following land take Removal of farm buildings and facilities Impact on agricultural produce of affected farms 	
Non-Agricultural Property Impacts	<ul style="list-style-type: none"> Impact on non-agricultural properties and land holdings including those used for commercial and industrial purposes, and public amenities and services 	
Air Quality	<ul style="list-style-type: none"> Change in non-greenhouse gas pollutants such as particulate matter and Nitrous Oxide 	<ul style="list-style-type: none"> PE-ENV-01106 - Air Quality Assessment of Specified Infrastructure Projects - Overarching Technical Document PE-ENV-01107 - Air Quality Assessment of Proposed National Roads - Standard
Noise and Vibration	<ul style="list-style-type: none"> Change in noise and vibration pollution New noise generation potential Noise mitigation opportunity available 	<ul style="list-style-type: none"> RE-ENV-07006 Common Noise Assessment Methods in Europe (CNOSSOS-EU): Interim Road Surface Correction Factors for National Roads in Ireland
Waste	<ul style="list-style-type: none"> Offsite disposal of suitable materials Offsite disposal of unsuitable materials 	<ul style="list-style-type: none"> GE-ENV-01101 - The Management of Waste from National Road Construction Projects

Sub-Criteria	Appraisal Considerations	Relevant Guidance to Consider
	<ul style="list-style-type: none"> Level of contaminated/ hazardous material left in situ 	<ul style="list-style-type: none"> GE-GEN-01101 Guide to the Implementation of Sustainability for TII Projects
Biodiversity (Flora and Fauna)	<ul style="list-style-type: none"> Negative impacts on sites of ecological significance Positive impacts on sites of ecological impacts 	<ul style="list-style-type: none"> PE-ENV-07005 - Survey and Mitigation Standards for Barn Owls to inform the Planning, Construction and Operation of National Road Projects GE-GEN-01101 Guide to the Implementation of Sustainability for TII Projects
Architectural Heritage	<ul style="list-style-type: none"> Impact on architectural heritage 	<ul style="list-style-type: none"> PE-ARC-02007 - Guidelines for the Assessment of Architectural Heritage Impacts of National Road Schemes PE-ARC-02008 - Guidelines for the Testing and Mitigation of the Wetland Archaeological Heritage for National Road Schemes
Archaeological and Cultural Heritage	<ul style="list-style-type: none"> Impact on archaeological sites Impact on sites of cultural heritage significance 	<ul style="list-style-type: none"> PE-ARC-02006 - Guidelines for the Assessment of Archaeological Heritage Impacts of National Road Schemes
Landscape and Visual	<ul style="list-style-type: none"> Impact on landscape or townscape Impact on visual receptors 	<ul style="list-style-type: none"> PE-ENV-01101 - Landscape Character Assessment (LCA) and Landscape and Visual Impact Assessment (LVIA) of Specified Infrastructure Projects - Overarching Technical Document PE-ENV-01102 - Landscape Character Assessment (LCA) and Landscape and Visual Impact Assessment (LVIA) of Proposed National Roads – Standard GE-ENV-01102 - A Guide to Landscape Treatments for National Road Schemes in Ireland GE-ENV-01103 - Guidelines on the Implementation of Landscape Treatment on National Road Schemes in Ireland
Soils and Geology	<ul style="list-style-type: none"> Impact on geological heritage sites Impact on areas with functions that geologically dependent 	<ul style="list-style-type: none"> TII Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes GE-GEN-01101 Guide to the Implementation of Sustainability for TII Projects

Sub-Criteria	Appraisal Considerations	Relevant Guidance to Consider
Hydrology	<ul style="list-style-type: none"> Impact on surface water bodies 	<ul style="list-style-type: none"> TII Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes GE-GEN-01101 Guide to the Implementation of Sustainability for TII Projects
Hydrogeology	<ul style="list-style-type: none"> Impact on groundwater bodies and aquifers 	<ul style="list-style-type: none"> TII Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes GE-GEN-01101 Guide to the Implementation of Sustainability for TII Projects

3.5 Economy – Transport User Benefits and Wider Economic Impacts

The measurement of economic transport user 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.

In addition to the transport user benefits, the MCA includes an additional criterion to identify and score any wider economic benefits of a project. Where non-exchequer funding is available for the project, this should be recorded in the MCA process under the Transport User Benefits. 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 full set of transport user benefits and wider economic impact criteria are presented in Table 7.0.8 below.

Table 7.0.8 Transport User Benefits and Wider Economic Impacts Criteria & Guidance

Sub-Criteria	Appraisal Considerations	Relevant Guidance to Consider
Travel Time	<ul style="list-style-type: none"> Level of user travel time savings generated by option 	<ul style="list-style-type: none"> TAF Module 8 PE-PAG-02014- Project Appraisal Guidelines Unit 5.0 - Transport Modelling Overview PE-PAG-02019 Project Appraisal Guidelines Unit 6.0 - Cost Benefit Analysis Overview

Sub-Criteria	Appraisal Considerations	Relevant Guidance to Consider
Transport Costs	<ul style="list-style-type: none"> Reduction in user travel costs created through an option. 	<ul style="list-style-type: none"> TAF Module 8 PE-PAG-02019 Project Appraisal Guidelines Unit 6.0 - Cost Benefit Analysis Overview PE-PAG-02022 Project Appraisal Guidelines Unit 6.3 - Guidance on using TUBA
Journey Reliability	<ul style="list-style-type: none"> Reduction in travel time variance provided by option 	<ul style="list-style-type: none"> TAF Module 8 PE-PAG-02019 Project Appraisal Guidelines Unit 6.0 - Cost Benefit Analysis Overview
Journey Quality ⁴	<ul style="list-style-type: none"> Reduction of overcrowding on public transport. Level of segregated infrastructure provided to active travel users. 	<ul style="list-style-type: none"> TAF Module 8 PE-PAG-02019 Project Appraisal Guidelines Unit 6.0 - Cost Benefit Analysis Overview
Change in Land-Use Value	<ul style="list-style-type: none"> Impact of the scheme on value of adjacent lands or lands in immediate vicinity. 	<ul style="list-style-type: none"> PE-PAG-02028 Project Appraisal Guidelines Unit 6.9 - Wider Impacts
Wider Economic Benefits	<ul style="list-style-type: none"> Ability of option to generate agglomeration benefits. Reduction in imperfect competition. Improvement in labour market participation. Inward investment opportunities generated Urban regeneration opportunities created 	<ul style="list-style-type: none"> PE-PAG-02028 Project Appraisal Guidelines Unit 6.9 - Wider Impacts
Funding Requirements	<ul style="list-style-type: none"> Level of Exchequer funding required 	<ul style="list-style-type: none"> PE-PAG-02021 Project Appraisal Guidelines Unit 6.2 - Preparation of Scheme Costs PE-PAG-02044 Project Appraisal Guidelines Unit 11.0 - Financial Appraisal

⁴ Journey quality is mostly relevant to the appraisal of public transport or active travel schemes.

3.6 Accessibility Impacts

TII projects can have significant impacts on the ability of transport users to access key services and amenities, other transport modes, and sites and areas of commercial and industrial importance. The accessibility sub-criteria which can be used in an MCA are presented in Table 7.0.9.

Table 7.0.9 Accessibility Impact Criteria & Guidance

Sub-Criteria	Appraisal Considerations	Relevant Guidance to Consider
Access to Key Services	<ul style="list-style-type: none"> Impact on access to retail, commercial and public services, educational facilities, and health facilities Impact on access to other national or local transport services or networks 	<ul style="list-style-type: none"> TAF Module 7 PE-PDV-02045 Traffic and Transport Assessment Guidelines PE-PDV-02046 Area Based Transport Assessment (ABTA) Guidance Notes
Access to Recreational Facilities	<ul style="list-style-type: none"> Impact on access to sports facilities, sports and social clubs, and public parks and playgrounds 	<ul style="list-style-type: none"> TAF Module 7 PE-PDV-02045 Traffic and Transport Assessment Guidelines PE-PDV-02046 Area Based Transport Assessment (ABTA) Guidance Notes
Access to jobs	<ul style="list-style-type: none"> Impact on access to job dense areas 	<ul style="list-style-type: none"> TAF Module 7 PE-PDV-02045 Traffic and Transport Assessment Guidelines PE-PDV-02046 Area Based Transport Assessment (ABTA) Guidance Notes
Access to International Gateways	<ul style="list-style-type: none"> Impact on access to airports Impact on access to ports 	<ul style="list-style-type: none"> TAF Module 7 PE-PDV-02045 Traffic and Transport Assessment Guidelines PE-PDV-02046 Area Based Transport Assessment (ABTA) Guidance Notes
Freight Access	<ul style="list-style-type: none"> Impact on HGV access to key industrial or commercial sites within study area 	<ul style="list-style-type: none"> TAF Module 7 PE-PDV-02045 Traffic and Transport Assessment Guidelines PE-PDV-02046 Area Based Transport Assessment (ABTA) Guidance Notes
Regional Balance	<ul style="list-style-type: none"> Impact on connectivity to peripheral regions and urban centres Impact on interurban connectivity 	<ul style="list-style-type: none"> PE-PAG-02014 Project Appraisal Unit 5.0 - Transport Modelling Overview

3.7 Social Impacts

Transport schemes can influence social outcomes including outcomes for socially disadvantaged users and transport users with different mobility needs. The envisioned infrastructure or transport service outputs of an option may also have differing impacts depending on a user’s gender. Social impact sub-criteria which should be included in an MCA are presented in Table 7.0.10.

Table 7.0.10 Social Impact Criteria & Guidance

Sub-Criteria	Appraisal Considerations	Relevant Guidance to Consider
Socially Disadvantaged Geographical Areas	<ul style="list-style-type: none"> Improved access for communities in officially designated socially disadvantaged areas 	<ul style="list-style-type: none"> PE-PDV-02046 Area Based Transport Assessment (ABTA) Guidance Notes
Vulnerable user groups	<ul style="list-style-type: none"> Impact on users with mobility difficulties Impact on users with hidden disabilities Impact on households with no car owners Impact on parents and carers with young children Impact on users from low-income groups or from disadvantaged social and economic backgrounds 	<ul style="list-style-type: none"> GE-GEN-01007 Applying a Gender Lens to TII Public Transport Projects

3.8 Land Use Impacts

Some TII schemes such as sections of new National Road can have significant impact on land use. These land use impacts focus on the socio-economic and connectivity outcomes arising from changes in land use that may be brought about by implementing an option as opposed to the environmental outcomes. The relevant sub-criteria to assess land use impacts are shown in Table 7.0.11.

Table 7.0.11 Land Use Impact Criteria & Guidance

Sub-Criteria	Appraisal Considerations	Relevant Guidance to Consider
Agricultural Impacts	<ul style="list-style-type: none"> Level of likely severance for farm holdings Farm viability following land take Removal of farm buildings and facilities Impact on agricultural produce of affected farms 	
Non-Agricultural Property Impacts	<ul style="list-style-type: none"> Impact on non-agricultural properties and land holdings including those used for commercial and industrial purposes, and public amenities and services 	

Sub-Criteria	Appraisal Considerations	Relevant Guidance to Consider
Change in Quality of Public Realm	<ul style="list-style-type: none"> Impact on access and use of public amenities and public spaces in urban areas 	<ul style="list-style-type: none"> TAF Module 7
Existing Transport Network and Service Impact	<ul style="list-style-type: none"> Impact on access to existing transport networks and services including cross border connections Impact of scheme on integration with existing transport network and services including cross border connections 	<ul style="list-style-type: none"> TAF Module 7
Zoned Land, Land Use Planning and Spatial Planning	<ul style="list-style-type: none"> Impact on land-use planning at national, regional and local level Impact on development opportunities for zoned lands in scheme study area Mitigation of urban sprawl risk 	<ul style="list-style-type: none"> TAF Module 7

3.9 Safety Impacts

As shown in Table 7.0.12, two principal safety impacts should be considered in the MCA, collision reduction and other safety impacts such as improved visibility.

Table 7.0.12 Safety Impact Criteria & Guidance

Sub-Criteria	Appraisal Considerations	Relevant Guidance to Consider
Collision Reduction	<ul style="list-style-type: none"> Impact on collision rates 	<ul style="list-style-type: none"> TAF Module 7 PAG Unit 6.4 – Guidance on using Cobalt PE-PMG-02001 Road Safety Impact Assessment PE-PMG-02005 Road Safety Impact Assessment Guidelines
Other Safety Impacts	<ul style="list-style-type: none"> Impact on station or service area safety Impact on active travel and vulnerable user security 	<ul style="list-style-type: none"> TAF Module 7 GE-GEN-01007 Applying a Gender Lens to TII Public Transport Projects

4. Transport Appraisal Framework Indicators

4.1 Overview

The following sections outline the indicators set out in the DoT TAF that should be considered for use in the detailed appraisal of Preliminary Options. As outlined in TAF not all criteria or sub-criteria may be relevant to every scheme. In these instances, the Sponsoring Agency may look to screen out or not consider specific sub-criteria. However, the intention to do this must be set out in the Phase 1 POD and agreed with the Approving Authority.

4.2 Accessibility Impact

The accessibility criterion in TAF and its related sub-criteria presented in Table 7.0.13 aim to assess the accessibility impacts of a Preliminary Option. Option scores should reflect the potential increase and decrease in accessibility to relevant workplaces, private and public services, and public amenities. Scoring of options under this criterion should be supported with analysis conducted using tools such as GIS.

4.3 Social Impact

The social criterion should capture the potential impact of a Preliminary Option on a range of user groups such as those from socio-economic disadvantaged backgrounds, transport users with different mobility needs and the potential impact on people of certain genders. This sub-criteria presented in Table 7.0.14 will be more relevant to the appraisal of some schemes over others.

4.4 Land Use Impact

The land use sub-criteria, as presented in Table 7.0.15, allow for impacts on urban public realms, integration with the existing transport network and transport services, and the connectivity between different zoned lands to be assessed. The relevancy of sub-criteria such as change in the quality of the public realm will be dependent in part on whether a scheme is located in a rural or urban setting.

4.5 Safety Impact

The potential safety performance of an option in terms of its potential to reduce existing collision rates is assessed as part of the safety criterion as shown in Table 7.0.16. This should be done using existing collision rate data, TII's benchmark collision rates and the estimated collision rates following delivery of the option. Additional safety sub-criteria may be relevant to schemes with a public transport component. The use of additional sub-criteria for the safety assessment should be agreed in advance of detailed appraisal of Preliminary Options taking place.

4.6 Climate Change Impact

As show in Table 7.0.17, an option's score under the climate change sub-criteria should reflect its ability to promote travel patterns which reduce the carbon footprint of transport users. The criterion also aims to capture an option's potential ability to deliver infrastructure or services which are resilient to climate change induced events such as higher rainfalls and sea levels. Previous analysis conducted for the MCA assessment may be useful for completing this part of the TAA.

4.7 Local Environment Impact

The impact of an option on local environmental conditions should be captured as part of the TAA. The assessment of local environmental impacts will be able to draw upon previous analysis conducted as part of the MCA assessment as many of the assessment indicators will utilise the environmental impacts already assessed as part of the requirement under the EU EIA Directive. A variety of tools and data sources can be utilised for this element of the TAA as shown in Table 7.0.18.

Table 7.0.13 Accessibility Impact Sub-Criteria, Indicators and Tools/Data

Accessibility Sub-Criteria	Indicators to be Assessed	Potential Tools and Data	Key Performance Indicator (by mode) Opening v Base Case
Access to Services	Increase/decrease accessibility within catchment area of the following: <ul style="list-style-type: none"> • Urban Centres • Educational Facilities • Healthcare Facilities • Major land transport hubs and interchange facilities such as rail and bus stations 	GIS Mapping of Study Area: <ul style="list-style-type: none"> • Ordnance Survey Ireland (OSI) Prime2 mapping • GeoDirectory mapping • Public Transport Accessibility Levels (PTAL) mapping 	<ul style="list-style-type: none"> • Percentage change in those with in a 30min walk/cycle/PT of the urban centre • Percentage change in those with in a 30min walk/cycle/PT of schools and educational institutions and health care facilities • Percentage change in those with in a 30min walk/cycle/PT of hospitals and health care facilities
Access to Recreational Facilities	Increase/decrease accessibility within catchment area of the following: <ul style="list-style-type: none"> • Parks and playgrounds • Sports clubs and facilities 	GIS Mapping of Study Area: <ul style="list-style-type: none"> • Ordnance Survey Ireland (OSI) Prime2 mapping • GeoDirectory mapping • Public Transport Accessibility Levels (PTAL) mapping 	<ul style="list-style-type: none"> • Percentage change in those with in a 30min walk/cycle/PT of playgrounds • Percentage change in those with in a 30min walk/cycle/PT of Sports clubs and facilities
Access to jobs	Population and job density along option alignments Interaction of option with areas of population and job density within scheme study area.	GIS Mapping: <ul style="list-style-type: none"> • CSO Small Area Population Statistics 	<ul style="list-style-type: none"> • Percentage change in number of jobs available to those within a 30min walk/cycle/PT of intervention
Access to International Gateways	Accessibility impact of option interaction with ports and airports within the study area.	Qualitative Assessment	<ul style="list-style-type: none"> • Change in frequency of public transport connection to major international gateway as a result of the scheme • Change in HGV/LGV ability to access international gateway following intervention
Freight Access	Level of goods traffic to and from key industrial, logistical and commercial sites.	Qualitative Assessment Traffic Modelling	<ul style="list-style-type: none"> • Change in dedicated freight access facilities, such as dedicated lanes, or freight terminals following intervention • Change in ability of LGVs to access urban centres following the intervention • One or both of these indicators may be used depending on the scheme

Table 7.0.14 Social Impact Sub-Criteria, Indicators and Tools/Data

Social Sub-Criteria	Indicators to be Assessed	Potential Tools and Data	Key Performance Indicator (by mode) Opening v Base Case
Accessibility impact on socially disadvantaged groups.	Access to a sub-set of the Services, Jobs and Recreational Facilities discussed above with reference to the impact on deprived groups.	GIS mapping: <ul style="list-style-type: none"> • Pobal Deprivation Index Data • CSO Income Distribution Data 	Percentage change in those with in a 30min walk / cycle of the urban centre / schools / hospitals / recreational amenities, for socially deprived transport users. Sponsoring agencies should examine the following indicators considered under accessibility: <ul style="list-style-type: none"> • Access to urban centres • Access to schools • Access to healthcare facilities For each of these indicators they should examine GIS map of the relative deprivation of the scheme area and make an assessment of whether accessibility benefits of the scheme are likely to accrue to those from more or less deprived households
Transport users with different mobility needs	Details on how the intervention may impact on transport users with disabilities and reduced mobility and difficulty accessing transport services	<ul style="list-style-type: none"> • Scheme Detail / Qualitative Assessment • Level of infrastructure provided that accommodates users with different mobility needs 	<ul style="list-style-type: none"> • Discuss how a scheme/facilities will impact transport users with disabilities or limited mobility this can include discussion of new facilities such as wheelchair ramps or accessible real time information displays
Gender Impacts	Details on how the intervention may have gender specific impacts.	Transport mode use by gender <ul style="list-style-type: none"> • Scheme Detail / Qualitative Assessment • Survey data on perception of safety of specific transport modes by gender. 	<ul style="list-style-type: none"> • Discuss how a scheme/facilities will impact transport users and how these may vary by gender, for example improved public lighting, and segregated cycling facilities have been shown to be particularly import factors in attracting female transport users. Any discuss of impacts should be robust and back up with relevant research

Table 7.0.15 Land Use Impact Sub-Criteria, Indicators and Tools/Data

Land Use Sub-Criteria	Indicators to be Assessed	Potential Tools and Data	Key Performance Indicator (by mode) Opening v Base Case
Change in quality of public realm	Disruption or removal of public spaces, streetscapes and amenities during construction. Long-term disruption to public spaces, streetscapes and amenities from operation of scheme.	<ul style="list-style-type: none"> • Scheme Detail / Qualitative Assessment • Traffic modelling 	<ul style="list-style-type: none"> • Discuss how a scheme/facilities will impact on public realm. These impacts may include provision of public amenities and green space
Connectivity with existing public transport facilities	Level of integration with existing transport infrastructure and services	<ul style="list-style-type: none"> • Scheme Detail / Qualitative Assessment 	<ul style="list-style-type: none"> • This should outline the degree to which a scheme integrates with the existing transport network and major transport hubs. It may also consider the level of alignment with overarching transport strategies and how a scheme may act as an enabler of future network development
Connection to zoned lands as part of national and regional planning.	Increased connectivity between areas zoned for different purposes	<ul style="list-style-type: none"> • Scheme Detail / Qualitative Assessment • Traffic modelling 	<ul style="list-style-type: none"> • Details on if the scheme provides a connection with land zoned for residential or industrial use and acts as an enabler for key national or regional policies such as the National Planning Framework (NPF), Regional Spatial and Economic Strategies (RSES) and Local Area Plans

Table 7.0.16 Safety Impact Sub-Criteria, Indicators and Tools/Data

Safety Sub-Criteria	Indicators to be Assessed	Potential Tools and Data	Key Performance Indicator (by mode) Opening v Base Case
Change in collision rates	Collision rates compared to TII benchmark collision rates Accident rates for active travel users	<ul style="list-style-type: none"> • RSA data • An Garda Síochána collision data • TII collision rate benchmarks • COBALT • TEAM Tool 	<p>Where it is not possible to obtain collision data then a realistic qualitative assessment should be made of the road safety conditions before and after the intervention. This may include factors such as:</p> <ul style="list-style-type: none"> • Vehicle Speeds • Protection for vulnerable road users such as pedestrians and cyclists • Removal of areas which have led to previous collisions such as dangerous road alignments


Table 7.0.17 Climate Change Impact Sub-Criteria, Indicators and Tools/Data

Climate Change Sub-Criteria	Indicators to be Assessed	Potential Tools and Data	Key Performance Indicator (by mode) Opening v Base Case
Climate change mitigation	Modal shift to public transport or active travel Emissions reduction through change in travel patterns enabled by option	<ul style="list-style-type: none"> • Transport Modelling • TUBA • COPERT • TII Road Emissions Model • TII TEAM tool 	<ul style="list-style-type: none"> • Percentage change in mode share from private vehicles to public transport and active travel modes • Percentage change in private car kilometres travelled • Percentage change in CO₂ emissions
Climate change adaption	Infrastructure and service vulnerability to climate related events including flooding and increased erosion	<ul style="list-style-type: none"> • OPW flood mapping • Coastal erosion data • Rainfall data 	Change based on Climate Hazard assessment. Where this is not possible a Qualitative Assessment may be used but scores should be based on a robust evidence base such as observed impact of schemes or a similar scale.

Table 7.0.18 Local Environment Impact Sub-Criteria, Indicators and Tools/Data

Local Environment Sub-Criteria	Indicators to be Assessed	Potential Tools and Data	Key Performance Indicator (by mode) Opening v Base Case
Air quality	Change in non-greenhouse gas, air pollutants such particulate matter. Public exposure levels to the pollutants	<ul style="list-style-type: none"> • Transport Modelling • COPERT • TII Road Emissions Model • Local air quality data 	Percentage change in the following local air pollutants should be estimated where possible: <ul style="list-style-type: none"> • PM2.5 • PM10 • SO2 • NOx
Noise and vibration	Change in noise pollution Change in localised vibration levels	<ul style="list-style-type: none"> • TII noise mapping • EPA noise mapping • Local vibration generation data 	This is an assessment of noise pollution currently being experienced in the scheme area and a qualitative assessment of how this will be impacted when by the proposed scheme. This assessment should be supported by robust evidence such as the impact of similar interventions elsewhere
Biodiversity	Impact on protected sites and habitats.	<ul style="list-style-type: none"> • Scheme Detail / Qualitative Assessment 	Note if the scheme impacts on any designated sites and habitats.
Water Resources	Impact on surface water bodies Impact on ground water bodies	<ul style="list-style-type: none"> • Scheme Detail / Qualitative Assessment 	Note if a scheme impacts on surface water and watercourses
Landscape and visual quality	Impact on landscape character Impact on local household vistas	<ul style="list-style-type: none"> • Scheme Detail / Qualitative Assessment 	Note if a scheme impacts on the landscape and significant landscape features



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