An Roinn Caiteachais Phoiblí
agus Athchóirithe
Department of Public
Expenditure and Reform

Technical Appraisal Review

N6 Galway City Ring Road Proposal

Proposal

The construction of the N6 Galway City Ring Road

Sponsoring Agency

Galway County Council

Sanctioning Authority

Government (project value is greater than €100 million)

Received by

Transport Vote Section, DPER

Date received by IGEES Unit

(formerly Central Expenditure Evaluation Unit)

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First reviewer

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Important Note:

In 2013, the Department of Public Expenditure and Reform issued a revised and updated set of Value for Money standards, known as the Public Spending Code (http://publicspendingcode.per.gov.ie).

The Public Spending Code requires Government Departments and Agencies to undertake cost benefit analysis or economic appraisal on all expenditure proposals with an estimated value in excess of €20 million. Departments are further required to submit appraisals to the Department of Public Expenditure and Reform for technical review.

It is important to note that the technical review of project appraisals, focuses only on the quality of the analysis under consideration by reference to methodological norms including those set out under the Public Spending Code. All reviews are neutral in terms of policy and ultimate conclusions relate only to whether the appraisals are robust and whether the analysis supports the conclusions drawn. This technical review has been carried out by the IGEES Unit in the Department of Public Expenditure and Reform

1. Introduction and Background

This document provides a technical review of the N6 Galway Ring Road Business Case. The purpose of this technical review is to assess the robustness of the analysis carried out, in the context of the central technical appraisal guidance as specified in the Public Spending Code.

The proposed scheme is a transport project comprising of the construction of approximately 5.6km of single carriageway and approximately 11.8km of dual carriageway around Galway city, to be supported by associated link roads, side roads, junctions and structures including a bridge crossing the river Corrib. The overarching aim of the project is to relieve congestion within Galway city by providing an alternative transport route to traffic seeking to pass through rather than link into the city.

The target cost of the development, adjusted for inflation, is €558.3 million. The total scheme budget is given as €593.33 million. Assuming the Total Scheme Budget is utilised, the Net Present Value for the preferred route option is €1.33 billion and the Benefit-Cost ratio is 3.92, under the Central Growth scenario.

2. Objectives

As specified in the Public Spending Code, proposed business cases should include scheme objectives, laid out as clearly and precisely as possible. Objectives should be expressed in terms of the benefits they are expected to provide, and those whom they are intended to benefit. Objectives should be formulated in such a way that they may in theory be attained through a variety of different strategies; for example through different route options or alternative transport infrastructure.

As laid out on pages 26-27 of the submitted Business Case, there are sixteen separate objectives spanning over the domains of Economy, Safety, Environment, Social, Integration and Physical Activity. In general the objectives are set out clearly and are specific to the overall project. One minor observation would be that some of the objectives as stated may appear to relate more to project implementation as opposed to material changes sought, or overall outcomes of a given project. For example, the objectives to deliver a cost effective project, or limit environmental impact may be more readily applicable to project implementation i.e. how the project is carried out, rather than objectives motivating intervention.

3. Options

Before a project can be put forward for proposal, sufficient consideration of viable alternatives options should be undertaken. This allows for a contrast between the various advantages and disadvantages

of options and assists in establishing a preferred option. This business case identifies three broad option ranges and evaluates each of those in turn. The three broad options identified are:

- Do-Minimum Alternative
- Traffic Management Alternative
- Major Scheme Investment Alternative

The *Do-minimum* option comprises the existing network and a number of minor upgrades to junctions and routes such as the implementation of new bus lanes and upgrading of roundabouts. The details of what would be included in this strategy are discussed, however the analysis concludes that the strategy will not result in addressing the key objective of congestion reduction or increasing road safety.

The *Traffic Management Alternative* comprises of two possible strategies which focus on traffic control without large scale road development. The fist strategy, *Public Transport Only* presents a series of public transport upgrades which would increase bus frequency and prioritisation of public transport along major routes. It was found that this option would reduce car trips by less than 1%, and therefore, if implemented in isolation, would fail to meet the key objectives as set out previously. The second strategy within this option considers the implementation of the *Galway Transport Strategy*, a wider integrated transport strategy developed by several stakeholders and transport authorities. This is derived from a compilation of studies considering the quality of experience for all road users, such as pedestrians, cyclists, public transport users, and car users. The primary elements of this plan include some road upgrades and schemes to address traffic flow within the city directly, such as fiscal traffic control measures (surcharge for entering city via car), additional capacity for public transport, and development of new infrastructure for cyclists and pedestrians. Again it was found that without the development of a tertiary route relieving congestion in the city centre, the effectiveness of this plan would be severely limited.

The third range of possible strategies presented in the business case puts forward several possible Major Scheme Investments. All of these strategies consider the provision of a new route around Galway city, which will enable through-traffic to bypass the city centre. This set of strategies represents the highest level of intervention as it presents relatively significant costs. The options examined in this grouping included a bridge crossing Lough Corrib, a coastal road, and a series of outer bypasses – including the development of a new road and updating of existing roads. For ecological and effectiveness reasons the Lough Corrib bridge and coast road are disregarded. The remaining options are shortlisted and compared against each of the stated objectives. The outcome of the analysis indicates that the most preferable option is the "pink route", or the construction of a new ring road, as proposed in this business case.

Thus, the appraisal identifies a number of alternative options. These options include the do-minimum, traffic management solutions and road based solutions. Further option analysis is carried out on the different routes for road based solutions where each option is analysed against the stated objectives.

4. Analysis

Costs

The total scheme budget estimate for the proposed project is outlined in the table below, as it appears in the business case (2016 factor prices):

Cost	€M (incl. VAT)
Total Scheme Budget	€593.33M
Target Cost	€558.29M
Inflation allocated to Target Cost	€39.58M

A high-level breakdown of costs over expected expenditure areas is provided in the business case in 2011 factor prices.

Cost	Cost €,000
Construction	€378,735
Supervision	€11,521
Land	€202,807
Planning	€19,312
Sub-total	€612,376

A more detailed breakdown of costs including a projected expenditure time horizon is included in the CBA report, Appendix C (page 117). The analysis states that all costs will be fully incurred by end 2025. The components included in this breakdown are construction, supervision, archaeology, advance work & other contracts, residual network, land & property, and planning & design. Values are estimated using different sources; road costs have been estimated using TII PAG Unit 6.11; operations and maintenance for the tunnels and bridges were separately estimated with reference to out-turn costs on comparable existing structures. Costs are presented both in nominal terms, and adjusted for inflation. Risk is also included as a final addition and total scheme budget is given as €593.33M.

Benefits

The benefits which are quantified and entered into the CBA model are the associated benefits of reducing travel times and increasing travel time reliability for both consumers and business (e.g. reducing congestion), the safety benefits that would be realised with usage of the new road, the indirect tax revenues arising from the project, and the carbon emission reduction arising from new travel patterns as a result of plan.

In analysing the benefits of travel time saving and congestion reduction, traffic profiles are formed; these estimate road demand at different times of the week and day. Using the TII Project Appraisal Guidelines (PAG), peak period average estimations are derived from the data and annualised to

provide an annual estimation of peak traffic loads. The TUBA model is utilised to project multiple scenarios and to produce an estimation of benefits to consumers and business resulting from lower travel time and journey time reliability.

An assessment of potential safety benefits was undertaken using the Irish version of COBALT software. The software uses local data to estimate probability and severity and associated costs of collisions in a *with scheme* scenario and a *without scheme* scenario. Collision rates were estimated for each road on the Galway network and the projected benefits of proceeding with the scheme are estimated under a low, medium and high growth scenario. These benefits are included in the respective CBAs.

Finally, the residual value of the road, is calculated according to the TII PAG and added as a benefit. The residual value of the road is estimated over a 30 year period based on the TII PAG guidance.[1] The PSC states that 'if the project has capital assets that have a useful life exceeding the time period of the CBA, the residual values of the assets should be calculated and included as a benefit. It is important that residual values are accurately estimated and include any offsetting costs such as decommissioning or remediation costs'. The business case as presented should clarify whether the costs profiled for the project are sufficient to provide a residual value as identified and would benefit from detailing the calculation of the residual value in more detail and whether it takes account of necessary maintenance/renewal expenditure.

Economic Parameters

The following key parameters were used in the appraisal analysis:

- ***Discount Rate*** – the annual rate of discount employed is set in line with the PSC guidance at 5%.
- ***Shadow Cost of Public Funds*** – the parameter applied to public funds is 1.3, as specified in the PSC.
- ***Shadow Cost of Labour*** – the parameter applied to the cost of labour is set at 0.8. The Public Spending Code recommends using a value between 0.8 and 1. Sensitivity analysis should be carried out in line with the PSC by setting the parameter to 1 in order to see how a change here affects the final results of the model.
- ***Shadow Cost of Carbon*** – the material specifies that the Shadow Cost of Carbon employed in the model is sourced from the TII PAG[2]. It appears that the base value taken in the model is €5.66/tCO_2[3]. Detail on how this value is arrived at and how it relates to the central guidance

[1] Project Appraisal Guidelines for National Roads Unit 6.1 - Guidance on conducting CBA. PE-PAG-02020 October 2016.
[2] €6.17/tCO2 in 2011 as per http://www.tiipublications.ie/library/PE-PAG-02030-01.pdf
[3] N6 Galway Ring Road – Phase 3 Design – Cost Benefit Analysis Report. Page 130, line 9.

could be included. It is noted that other TII appraisals have indicated that the €5.66/tCO_2 value is the result of adjusting the central 2014 parameter (€5.80) for inflation.

- ***Value of Time*** – The value of time parameter used is stated as being from the TII PAG and appears to be in line with values set out in the DTTaS Common Appraisal Framework.
- ***Model Time Horizon*** – the appraisal timeframe used in the model is thirty years. This is in line with the typical timeframe for large scale road and rail infrastructure investment projects.

Risk and Sensitivity Analysis

As detailed in the PSC, the consideration of risk should be factored into proposals to mitigate the likelihood or impact of unanticipated cost overruns/project failures. In assessing risk at the third phase, various experts and stakeholders convened to identify potential risks, develop a conclusive list, and quantify the risk at different levels of probability. The outcome of this process was the formation of a table of 87 potential risks, including details on risk assessment, risk management and risk quantification (Business Case Appendix B). The business case states that during the risk management process, the potential impact of many of the risks identified was mitigated. It was noted however that four significant risks remain:

- Unforeseen ground conditions impeding construction
- Potential redesign of Menlough Viaduct by An Bord Pleanala
- Risk of delay in construction interfering with Galway Races
- Risk of additional compensation on CPOs

The summary quantification of risk is calculated and presented in scenarios – minimum risk, most likely risk, and the maximum risk the project faces.

Minimum Risk	Most Likely Risk	Maximum Risk
€25,069,000	**€39,352,000**	**€53,635,000**

The risk analysis contributes to the identification of risks and allows for mitigation strategies to be put in place. The findings of the risk analysis are factored into the CBA and presented in terms of the preferred option. The value used is the *most likely risk* and is considered in the analysis as a cost.

In terms of general sensitivity analysis, the presentation of this and the extent of it could be clarified within the business case. The PSC notes that sensitivity analysis should test for significant changes in the key variables (e.g. 10-20% +/-). Given the detailed risk analysis that has been carried out around costs, the analysis would benefit from presenting final outcomes with sensitivity analysis based on these scenarios (i.e. presenting CBA results based on the minimum, most likely and maximum risk

scenarios rather than just the most likely scenario). Furthermore, and as detailed below, the sensitivity analysis in relation to demand should be clarified to a greater extent.

Projected Demand

To estimate the scale of the benefits arising from the proposed project it is necessary to make projections for the level of anticipated usage. The extent of future demand is an important factor in appraising a project. The potential outcomes of project implementation within the business case are modelled under three different demand scenarios; low growth, central growth and high growth. It is stated that the low scenario is based on population projections from the CSO (M2F2 Growth Forecasts). The medium and high growth scenarios are based on TII's national modelling.

The overall demand scenarios are presented on page 37 of the business case while the demand scenarios are further specified for each link of the project area in chapter 5. The growth rates for vehicular trips between 2012 and 2024 are listed as 5.1% in the low scenario, 8.1% in the medium scenario and 8.5%[4] in the high scenario based on table 3.4. In general, the demand scenarios present a range of sensitivity tests on the analysis.

It should be noted however that the medium and high scenarios appear to present relatively similar growth patterns as stated in table 3.4. As such, further detail and information should be given on the different demand scenarios and their development within the business case. This could include the variance between the low, medium and high scenarios and the rationale for the use of the CSO projections in the low scenario, as opposed to potentially the central scenario. Given the apparent similarity between the central growth and high growth scenarios, and as the low growth scenario is based on the CSO's projections[5], it would appear prudent to pay particular attention to the outputs obtained under the low growth scenario in interpreting the overall results.

[4] It should be noted that table 3.5 may contain an error with the difference between total trips in the 2039 high scenario and the 2012 base appears to equal 33.5%. This should be clarified within the business case.
[5] The DTTaS CAF states that the CSO M2F2 scenario is desirable for use in appraisal.

5. Model Results

The key measures returned from the CBA indicate a cost-benefit ratio of between 3.3 and 4.4 depending on final expenditure and traffic growth. The key result parameters of the analysis are reiterated below.

Key CBA Model Outputs assuming Target Costs (€'000)

	Present Value of Benefits	Present Value of Costs	Net Present Value	Benefit Cost Ratio
(i) Low Growth	€1,494,217	€425,686	€1,0668,531	3.51
(ii) Medium Growth	€1,781,208	€427,458	€1,353750	4.17
(iii) High Growth	€1,887,812	€425,879	€1,461,933	4.43
(iv) GTS Scenario	€1,518,620	€429,482	€1,089,138	3.54

Key CBA Model Outputs assuming Budget Costs (€'000)

	Present Value of Benefits	Present Value of Costs	Net Present Value	Benefit Cost Ratio
(i) Low Growth	€1,494,217	€452,562	€1,041,655	3.30
(ii) Medium Growth	€1,781,208	€454,334	€1,326,874	3.92
(iii) High Growth	€1,887,812	€452,754	€1,435,058	4.17
(iv) GTS Scenario	€1,518,620	€456,358	€1,062,262	3.33

6. Summary of Technical Assessment

The analysis as presented is detailed and generally appears to utilise the central parameters and approaches set out in the PSC. An analysis of current conditions has been detailed; objectives have been stated clearly; options have been proposed and analysed. The preferred option has been identified using a number of different demand scenarios and risks have been identified and quantified. Based on an overview assessment of the documentation received by DPER, the IGEES Unit would largely agree with the assessment undertaken by DTTaS's EFEU. However, as highlighted through this note, there are a number of areas where the presentation or approach should be further considered. For instance, consideration should be given to enhancing the presentation of sensitivity analysis within the business case. In particular, the approach to the demand scenarios could be clarified with regard to the variance between scenarios and the various scenarios developed for risk could be more integrated in the appraisal analysis as a sensitivity check.