Modelling Services Framework

Regional Model Development

Appraisal Tools - Economy

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1 Introduction

1.1 Background

As part of the Modelling Services Framework, Jacobs/SYSTRA have been commissioned by the National Transport Authority to develop a set of regional multi-modal transport models covering the main city regions in Ireland. As part of this commission, a scoping process has been initiated to define the most appropriate suite of appraisal tools to complement the regional models.

2 Overview of the Economy Appraisal Process

2.1 Scope of the Economy Appraisal Process

We are developing a number of separate appraisal processes:

- Safety
- Economy
- Reliability
- Environment
- Health Benefits
- Accessibility
- Social Inclusion
- Wider Economic Benefits

For the purposes of this note "economy" excludes any monetised impacts captured under the remaining seven processes. A subsequent note will describe how all of the impacts (monetised and non-monetised) may be drawn together within a single appraisal summary process.

The Economy appraisal will include impacts on:

- users of the transport system – money costs and travel time;
- transport providers – costs and revenues;
- other private sector businesses – money costs and travel time for employees, and for freight movements, and any contribution to scheme costs; and
- government – tax receipts and expenditure (CAPEX and OPEX).

We have assumed that, in the short term, the existing UK DfT TUBA software will be used to carry out the relevant calculations. The NTA and DTTAS may wish to consider the merits of developing a bespoke 'Irish TUBA' tool which would provide increased additional flexibility with respect to the precise methodology used to conduct the relevant appraisal calculations. Either way, the relevant economic input parameters will be tailored to match relevant Ireland values as closely as possible. The appraisal methodology which TUBA implements is documented in DfT's Transport Analysis Guidance (TAG[1]) Units A1.1, A1.2 and A1.3.

2.2 Indicators

The economy process will include the following indicators:

- Local government: revenue, operating costs, investment costs, grants and subsidy payments
- National government: revenue, operating costs, investment costs, grants and subsidy payments, indirect tax
- Transport users: travel time, vehicle operating cost, user charges (fares, tolls, etc); and
- Private sector businesses: revenue, operating cost, investment costs, grants and subsidy.

[1] www.gov.uk/transport-analysis-guidance-webtag

Summary indicators such as Present Value of Cost (PVC), Present Value of Benefits (PVB), Net Present Value (NPV) and Benefit Cost Ratio (BCR) will be an outputs of the Economy process. These summary indicators will be calculated in accordance with DTTAS guidance using the detailed indicators listed above as inputs.

Comment [SNS1]: Remove "an"

2.3 Analysing and Checking Economy Appraisal Results

It can be difficult to assess whether results of economic appraisals are robust and reasonable. Processes to analyse the spatial distribution of benefits are very helpful. TUBA allows users to dump detailed datasets of outputs. We propose that processes are developed to simplify the analysis and interrogation of the appraisal results, including sectored matrices of benefits and benefits per user.

3 Datasets Required

3.1 Main Source of Relevant Data

We understand that the DTTAS will shortly be publishing detailed guidance with respect to updated parameters for undertaking Common Appraisal Framework (CAF)-based appraisal of transport projects.

This guidance and its supporting spreadsheets will form the primary data source for the various economic appraisal parameters.

3.2 Model Data Required

The matrices listed in the table below must be extracted from the transport models. In principle either Production-Attraction (PA) or Origin-Destination (OD) format matrices could be used in the economy appraisal, so long as all units are consistent. For example if one-way OD trips are input to the appraisal then one-way OD time matrices must also be input. It is generally simpler to work with OD matrices in TUBA to avoid the need to construct PA cost matrices.

Matrix Type	Units
Demand	Pax or veh trips per hour
Travel time per journey	Hours (this is a TUBA requirement)
Charge (fare, toll, parking charges) per journey	Euro cent
Distance	km

3.3 Data Required Outwith the Model

Comment [SNS2]: Outside

Scheme specific appraisal parameters are input to TUBA as a "scheme file" including the following parameters:

- opening year;
- horizon year (eg opening +59 for a 60 year appraisal);
- modelled years (list);
- current year (the year in which appraisal is being done, and the first year in which TUBA permits that costs can be incurred);
- annualisation factors;
- CAPEX: by year, mode and type (construction, land, prep, etc); and
- OPEX: by year and mode.

TUBA does not allow residual values of assets to be included in the appraisal. It would be straightforward to add a discounted benefit for residual value to appraisal results in a reporting spreadsheet.

Generic economic appraisal parameters are input to TUBA as an "economics file" including the following parameters:

- GDP index in base year;
- average indirect tax rate;

- values of time;
- vehicle operating cost parameters (including fleet mix by year);
- tax rates (on fares, tolls, parking charges, non-fuel operating costs, etc);
- default purpose splits;
- vehicle occupancy factors; and
- discount rates.

4 Implementation of the Economy Appraisal Process

4.1 Overview

The following steps were specified in the Task Order for the economy appraisal, and are discussed below.

- create process;
- test process;
- sign off;
- documentation;
- training;
- ongoing support;
- potential enhancements;
- additional research; and
- integrate / polish.

4.2 Creating the Process

4.2.1 Write standard economics file

The existing Irish standard economics file will be reviewed.

Economic parameters will be updated based on the a version of appraisal guidance which will be agreed with DTTAS and NTA.

Comment [SNS3]: the

4.2.2 Develop standard (or example) spreadsheets to process CAPEX and OPEX as required for TUBA:

Cost data are likely to be provided by engineers or quantity surveyors n the price base of a recent quarter (eg Q4 2014). They may or may not include contingency, optimism bias, etc. They may or may not make allowance for real cost inflation.

TUBA requires costs in a defined price base incorporating real inflation but not general inflation. Assumptions regarding the treatment of Optimism Bias (OB), risk and contingency will be agreed with the NTA and DTTAS. We will also agree with NTA and DTTAS whether the appraisal will work in market or factor prices.

4.2.3 Write scheme file generating programme:

The format of the TUBA scheme file is rather unwieldy. Therefore a script will be developed to generate the scheme file which will include functionality to append matrix details (file names and locations) for do minimum and do something runs to other data (eg years and cost data produced by the standard cost spreadsheet). This scripting functionality could be automated within the regional model Voyager process.

4.2.4 Write Voyager scripts to output matrices

Voyager scripts will be created to output demand and cost matrices in the formats and units required by TUBA.

4.2.5 Write TUBA batch file generator

TUBA batch files specify the input scheme and economic files. A process to create such batch files will be incorporated into the Voyager process.

4.2.6 Set up standard (or example) output analysis processes

Detailed output files can be exported from TUBA including data (eg time savings, etc) for each zone or sector pair. A database approach to processing these files will be required due to their size. The database will include functions to create a spreadsheet which can be more easily interrogated by users.

The spreadsheet will allow users to review the following outputs:

- costs and benefits by sector pair (ie a matrix);
- benefit per user by sector pair;
- lists of sector-pairs ranked by the scale of benefits and benefits per user; and
- demand changes by sector pair.

A standard sector system should be defined for each regional model to facilitate reporting. Users will also be able to run the reporting processes with sector systems that are tailored to the scheme being tested.

4.2.7 Process specifications

Process	Tool	Inputs	Reference for detailed approach	Outputs
Create standard economics file	n/a – text format	DTTAS guidance on appraisal parameters UK and existing Irish economics file (as examples of formats)	TUBA User Manual	Standard economics file
Standard OPEX and CAPEX spreadhseets	Excel	DTTAS guidance on format and units of costs for appraisal	TAG Unit A1.2	Cost spreadsheet Costs in a defined price base, including agreed OB and real inflation. Formatted for TUBA
Scheme file generation	Voyager (matrix program)	DTTAS guidance on appraisal periods File naming conventions for	TUBA User Manual	Script to generate a scheme file for specified do minimum and do something

		regional models		scenarios
Scripts to output demand and cost matrices	Voyager (matrix program)	File naming conventions for regional models	TUBA User Manual	Voyager scripts to output matrices in format and units required by TUBA
Batch file generation	Voyager (matrix program)	n/a	TUBA User Manual	Script to generate a batch file for specified do minimum and do something scenarios
Standard analysis processes	Access (or SQL server) and Excel	Format specification for TUBA output files	Agreed specification of analyses (to be agreed with NTA)	Database and spreadsheet tools to facilitate analysis and interrogation of economic analysis results.

4.3 Testing the Process and Sign Off

Steps in testing and signing off the processes will be:

- peer review of standard economic file;
- peer review of standard cost spreadsheets;
- detailed (independent) checking that the scheme file is as expected;
- check matrix totals, sector-sector, averages and ranges for the TUBA formatted data vs native Voyager and/or SATURN;
- detailed (independent) checking that the TUBA batch files are as expected;
- run TUBA for a sample scheme and sense check headline appraisal results; and
- check that headline appraisal results can be reproduced in the output analysis process.

4.4 Documentation, Training and Support

Documentation will include user note(s) for each process and evidence of testing.

A training programme will be agreed with NTA. Training topics could include:

- principles of economic appraisal;
- overview of processes;
- step-by-step training in running and checking processes; and
- worked exercises in assessing appraisal outputs.

It may be most appropriate to develop training courses for two types of user:

- users who will make use of summary outputs;

- users who will work with the detailed TUBA outputs, and interrogate model inputs results to debug or understand appraisals.

4.5 Potential Enhancements and Research

NTA may wish to develop their own scripts, spreadsheets or software to implement appraisal calculations rather than use TUBA. This would be feasible because the calculations are relatively straight forward. It may be desirable so that NTA could adapt methodologies (eg how fuel costs are calculated, whether tax changes are considered as costs or benefits, etc).