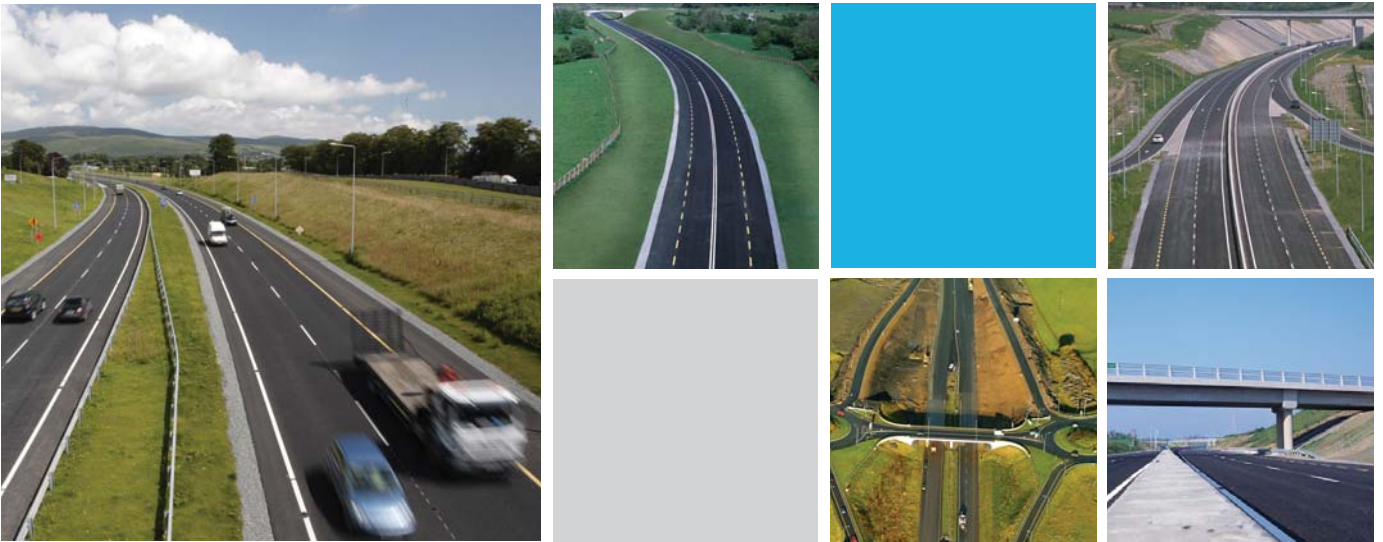


NATIONAL ROADS AUTHORITY

Project Appraisal Guidelines

Appendix 10 - TUBA guidance



March 2008

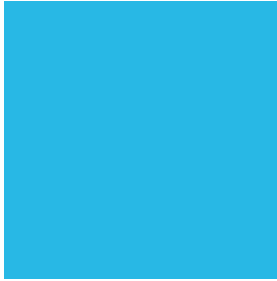
TUBA guidance		
Version	Changes made to document since previous version	Date issued
1.0	-	01.03.2008

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Table of Contents

1	Introduction	2
	Introduction.....	2
	Structure.....	2
2	TUBA guidance	4
	Guidance	4
	Contacts	4
3	Auditing TUBA.....	6
	Introduction.....	6
	Sources of error	6
	Sensitivity	7
	Summary of key audit areas	8
4	Enquiries	10

1 Introduction



1 Introduction

Introduction

- 1.1 This document is an appendix to the NRA's Project Appraisal Guidelines and provides advice on where to seek guidance on using the TUBA program and how TUBA assessments should be audited.
- 1.2 TUBA (Transport Users Benefit Appraisal) is a computer program, developed for the UK Department for Transport, for undertaking transport economic appraisals, primarily those involving variable demand.
- 1.3 TUBA undertakes a matrix-based appraisal, taking trip, time, distance and charge matrices from a transport model. These matrices may be disaggregated by vehicle type, purpose, and person type. The user also inputs other costs associated with the do-minimum and do-something schemes. TUBA will then calculate the user benefits in time, fuel Vehicle Operating Costs (VOC), non-fuel VOC and charges; operator and government revenues; and the scheme costs, discounted to the present value year.
- 1.4 TUBA will interpolate, between input model year information, and extrapolate beyond the last modelled year on the basis of no change in benefits beyond that point. Thus the full appraisal period is covered.
- 1.5 The output file contains all these results for various degrees of disaggregation and also presents the data in a series of summary tables showing the transport economic efficiency of the transport system, known as TEE tables. Results are reported as perceived costs and market prices.
- 1.6 TUBA does not calculate benefits that are due to changes in accident costs. The derivation of accident cost savings should be undertaken using the COBA program.
- 1.7 It should be noted that TUBA does not undertake any recalculation of model link speeds, as per COBA, and is therefore wholly reliant on the quality of the transport model.

Structure

- 1.8 Following this introduction, the appendix is split into the following sections:
 - Section 2 – Guidance on TUBA;
 - Section 3 – Auditing TUBA; and
 - Section 4 – Enquiries.

2 TUBA guidance



2 TUBA guidance

Guidance

2.1 Reference should be made to <http://www.dft.gov.uk/pgr/economics/software/tuba/> for the following information:

- General guidance and advice on the application of TUBA:
<http://www.dft.gov.uk/pgr/economics/software/tuba/tubaguidance>
- Obtaining the software and assistance in running it:
<http://www.dft.gov.uk/pgr/economics/software/tuba/tubausermanual>
- Demonstrations:
<http://www.dft.gov.uk/pgr/economics/software/tuba/tubademonstrationexamples>
- Frequently asked questions:
<http://www.dft.gov.uk/pgr/economics/software/tuba/tubafrequentlyaskedquestions>

Contacts

2.2 News of the latest developments and updates for TUBA can be found at:
http://www.dft.gov.uk/stellent/groups/dft_econappr/documents/sectionhomepage/dft_econappr_page.hcsp

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3 Auditing TUBA



3 Auditing TUBA

Introduction

- 3.1 Undertaking CBA using TUBA does not lend itself to the detailed audit checklists that need to be considered when undertaking CBA using COBA. TUBA is wholly reliant on the traffic model for trip times and costs, and does not require network building and validation as is the case with COBA. As such, the output from TUBA in terms of the calculation of user benefits is heavily dependent on the integrity of the traffic model, from which the input matrices are derived.
- 3.2 The output from TUBA may highlight areas of the traffic modelling which need further investigating, and in some cases identify errors that were previously not identified. It is not unusual to have to revisit the model, after running TUBA, to address issues.
- 3.3 In the following sections the main sources of error when undertaking a TUBA assessment are discussed. For a more comprehensive explanation of the issues, reference should be made to:
- The TUBA User Manual <http://www.dft.gov.uk/pgr/economics/software/tuba/tubausermanual>; and
 - The TUBA Guidance <http://www.dft.gov.uk/pgr/economics/software/tuba/tubaguidance>.

Sources of error

Standard economics file

- 3.4 A default standard economics file is provided in Appendix 11, which is available to download from the NRA's website. Economic and traffic related parameters in this file have been replaced with values applicable to the Republic of Ireland. This file must be used for TUBA assessments for the NRA, rather than the file provided with the software, which contains UK parameter values. It is important therefore that any audit of a TUBA assessment confirms in the first instance that the correct standard economics file has been used.

Scheme file

- 3.5 The scheme file allows the TUBA user to define data specific to the scheme being modelled, including the scheme costs. It is also used to specify the trip and cost matrices generated by the transport model, requiring the user to enter information relating to:
- The user class(es) to which the matrix applies;
 - The time slice(s) to which the matrix applies;
 - The type of data (i.e. vehicle trips, person trips, travel time, distance, or charge);
 - The matrix format (e.g. CSV format);
 - The scenario (i.e. Do-Minimum or Do-Something);
 - The modelled year;
 - A factor for converting the data to the correct units, and
 - The filename.
- 3.6 TUBA undertakes a number of checks on the consistency of the input matrices as follows:
- Trip matrices defined for both scenarios and for each modelled year;
 - Time matrix defined for each trip matrix;
 - Distance matrix defined for vehicle matrices;
 - Consistency in use of user classes between scenarios;
 - Maximum matrix cell values, and
 - Ratio of DM to DS travel times and distances.

3.7 The checks on the maximum values of matrix cells are as follows:

Data	Maximum
Passenger or vehicle trips	100,000 trips / hr
Distance	1,000 km
Time	10 hrs
Charge	50,000 pence*

* Note: TUBA assumes UK monetary denominations. The calculations that are undertaken within the program are still valid for Euros and cents.

3.8 These checks are intended to identify possible errors in the units (e.g. minutes instead of hours) or anomalies in the source data. Whilst they serve as a reasonable sense check it is important to note that inputting errors by the user can still occur.

3.9 Clearly matrix definition is an important element of the scheme file and it is relatively easy to make errors in doing this. For example, a user can input a matrix corresponding to a different time period (e.g. a PM peak time matrix when the AM is required). Similarly, matrices relating to different user classes can easily be confused - especially if file names are ambiguous. Such errors will not always be picked up by the checks described above; however they may become apparent in the next series of checks, which compare matrices from the Do-Minimum (DM) and Do-Something (DS).

3.10 TUBA also undertakes a check on the ratio (r) of DM to DS costs (time and distance) as follows:

Value of r	Action
$r < A$ or $r > D$	Serious warning
$A < r < B$ or $C < r < D$	Warning
$B < r < C$	OK, no warning

3.11 The values of A, B, C and D are:

A	B	C	D
0.33	0.67	1.5	3

3.12 These checks are made because, in the case of large changes in cost, the rule of a half which is used to calculate user benefits may not be valid. The TUBA Manual provides advice on how users should deal with situations when this is the case. It should also be borne in mind that large changes in costs may also be due to modelling errors and assumptions. For example, forecast delays at locations in the network could have been adversely influenced by inaccurate assumptions regarding traffic signal times.

3.13 Warnings and serious warnings therefore indicate possible anomalies in the input data and should be investigated. Errors will cause the TUBA calculation to stop and must be resolved before TUBA can run to completion.

Sensitivity

3.14 An important output from TUBA is the SENSITIVITY table. The information in this table can be used to assess the sensitivity of the user benefits to the level of convergence in the transport model. The smaller the numbers reported in this table, the more sensitive the results. WebTAG (UK)¹ gives the following guidance on determining whether model convergence is adequate, given the size of the scheme benefits.

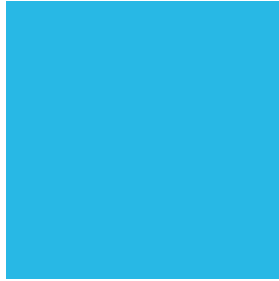
¹ Source: Para 1.5.6 http://www.webtag.org.uk/webdocuments/3_Expert/10_Variable_Demand_Modelling/3.10.4.htm

“Convergence and scheme benefits. *The required level of convergence needs to be linked to the scale of the benefits of the scheme being appraised, relative to the network size. For instance the calculation of benefits from small schemes in large networks will be much more sensitive to convergence than large schemes in small networks. On the basis of testing it has been discovered that **ideally the user benefits, as a percentage of network costs, should be at least 10 times the % Gap achieved in the Do-Minimum and Do-Something scenarios.** The estimation of user benefits can be estimated either by using matrix manipulation of the with and without scheme trip and skimmed generalised cost matrices to produce an estimate of the consumer surplus by the rule of a half, or by using the DfT’s TUBA program. In either case the worst case convergence of the ‘with’ and ‘without’ scheme runs should be taken as the one to compare with the size of the benefits”.*

Summary of key audit areas

- 3.15 On receipt of TUBA input and output files, the following areas should be the main focus of the audit:
- Confirmation that the correct standard economics file has been used, which uses parameter values specific to the Republic of Ireland;
 - In the scheme file, a check should be made to confirm that the parameters defining the scheme are correct, in particular the input matrices;
 - From the output file, it will be necessary to establish whether there are any serious warnings still remaining. Those that do remain should be backed up by an explanation within the CBA report, documenting that they have been considered and the reason why they are deemed acceptable. The presence of unexplained serious errors would suggest that steps to address the rule of half issue had not been taken, or potentially there were errors in the model.
 - Also, from the output file, the data relating to the user benefits as a percentage of the DM user should be examined and compared against the gap statistic from the traffic model. This information should be used to determine whether the reported scheme benefits are likely to be have been influenced by the convergence of the model.
- 3.16 Given the link between the traffic model and the TUBA input, the integrity of the model will be the most significant factor influencing the TUBA results. Robust checking of the base model and forecast assignments should provide a degree of assurance that TUBA results are valid.

4 Enquiries



4 Enquiries

All enquiries should be directed to:

Transport Economist,
National Roads Authority,
St Martin's House,
Waterloo Road,
Dublin 4.