Project Appraisal Guidelines

Unit 6.3 TRL COBA Report

July 2011

Project Appraisal Guidelines

Unit 6.3
TRL COBA Report

Version	Date	Comments
1.0	July 2011	New Guidance

This document is available to download at www.nra.ie/publications/projectappraisal

For further queries please contact:

Strategic Planning Unit
National Roads Authority
St Martin's House
Waterloo Road
Dublin 4

Tel: (01) 660-2511
Email: info@nra.ie
Web: www.nra.ie

1   Introduction

1.1.   This report has been prepared by TRL LIMITED (TRL) as a deliverable in a project to develop a version of the COBA software package specific to the Republic of Ireland.

1.2.   The main objective of the project is to develop a version of COBA specific to the Republic of Ireland and in accordance with the specification provided to TRL by AECOM and the National Roads Authority (NRA). The final software product (including the UK version) will be made available to the client in executable format.

1.3.   The scope of the work is based on the requirements specification document dated 26th June, 2007 and the following key elements are essential for the project:

- Provision of a number of Ireland specific road types with associated speed flow curves and accident rates (likely to be a maximum of two types);
- Alter references to DfT and £STG in the program;
- Replace the following parameters / data items with appropriate Irish values:

    - Values of time & growth thereof;
    - Fuel and non-fuel VOC parameters and growth thereof;
    - Flow groups;
    - Vehicle occupancy rates and changes over time thereof;
    - Proportions of vehicles in work and non-work time;
    - Vehicle fleet composition;
    - Accident rates and values and changes in time thereof;
    - Traffic growth rates;
    - Economic growth rates;
    - Discount rates and changes in time thereof;
    - Default appraisal period;
    - Maintenance costs by road type;
    - Indirect tax rates and changes in time thereof, and
    - Carbon cost.

- A number of additional tasks have been communicated between the customer and TRL, some of which are listed below:

    - Adjusting the weekday and weekend x-factor to 1.0 for Irish COBA;
    - TRL to investigate the conversion of petrol and diesel costs per litre into resource costs;
    - TRL to investigate carbon cost calculation between UK COBA and Irish COBA, and
    - TRL to investigate incorporation of HEATCO accident under-reporting factors (N.B. Fatal factor to be set to 1.00).

1.4.   Further requirements stated in the June 26th document but not included in this project outline and therefore, not this report are:

- Provide existing users of COBA in Ireland with a copy of Irish COBA at no additional cost.

- Any future purchaser of the Irish version of COBA to receive copies of both versions at the existing standard purchase cost (UK purchasers to receive Irish version at no additional cost if requested.
- In the future, DfT or NRA can instruct TRL to update / amend their version as they see fit but will keep the other party informed of developments in advance so they can be coordinated if necessary

1.5.   In 2011 the following further changes were made :

1. Revisions were made to the following parameter values:
- Value of Time
- Casualty costs
- Accident Costs
- Fuel Vehicle Operating Costs
- Fuel Prices
- Non-fuel Operating Costs
- Value of Time Growth factors
- Values of Accidents Growth Factors
- Vehicle Operating Costs. Fuel Price Growth
- Vehicle Operating Costs growth rates
- Indirect Tax Rates
- Changes in Indirect Taxes
- Default Seasonality Index
- Default M-factor coefficients
- Link and Junctions Combined Accident Rates
- Link and Junctions Combined Accident Proportions
- Average number of Casualties per Accident
- Accident Rate Reduction Factor
- Casualties per Accident Change factor
- Annual Average Category Proportions by Class of Network
- Annual Vehicle Category Adjustment Factors
- Vehicle Category Proportion Correction Factors
- Vehicle Occupancy Rates by Flow Group and Time
- Vehicle Proportions by Time Mode and Flow Group
- Speed flow relationship for 2+1 type road.

2. The carbon emissions included in the 2007 version were replaced by a model for a wider range of emission products

3. A new 'Residual' item was introduced in Table 15C. This figure represents the further Net Present Value (NPV) which would have accrued had the appraisal been extended for a further 10 years ('Minor' appraisal) or 30 years ('Major' appraisal).

5. A new Constructions Emissions item has been introduced on Key055, with the corresponding output in Table 12.

The Differences between UK and Irish COBA

1.6.　　The main changes have been introduced to the:

- default values;
- layout of road classes and accident types;
- calculation of carbon costs;
- calculation of the accident costs, and
- currency.

1.7.　　The default values are the values which are 'hard-coded' into the executable file and which are used in calculations if not given by the user data file. The default values cannot be changed by user, but they can be overridden by the values in the data file.

1.8.　　Three new types of motorways - 'Rural All Purpose Dual Carriageway Type 2', '2+1 road with central barrier', '2+1 road without central barrier' - specific to Ireland were added to the existing motorway set. The layout and numbering of Irish road classes is different from the UK version and is presented in the Section 2.1.22

1.9.　　The change of carbon prices is introduced to the calculation of carbon costs. The rate of change of carbon costs is not constant and changes within scheme. The duration of the scheme is divided into 6 time intervals, and the carbon cost change rates are defined for each interval. The intervals and the values of the cost rate of change are presented in the Section 2.1.23.

1.10.　　The accident cost calculations are introduced to the Irish version. The accident under-reporting factors take into account the fact that not all accidents are reported to officials and that the total number of accidents can be greater than the official statistical data. The accident under-reporting factors are implemented for three accident categories, fatal, serious and minor. The values of under-reporting factors are hard-coded into the program.

2　Changes to UK COBA dataset

2.1.　　This section only describes the parameters and data which have different values and/or structure between the two versions of COBA.

Key parameters

2.2.　　Changed according to [1], Section C, Table CA .1. The changes are presented in Table A1.

Maintenance costs

2.3.　　There are 3 distinct maintenance types, Single Carriageway, 2+1, and Dual Carriageway. The values of Maintenance costs are presented in Table A2. The default correspondence between maintenance types and road class are given in Table A28.

Value of Time (VoT)

2.4.　　In the Irish dataset the values are implemented according to [1], Section C, Table CA.3. The values used in datasets presented in Table A3.

Accident costs

2.5.　　In the Irish dataset the values are implemented according to [1], Section C, Table CA.4. The values used in datasets presented in Tables A4, A5.

Vehicle Operating Costs (VOC)

2.6.　　The default values of fuel related vehicle operating cost are calculated using three coefficients 'a', 'b', 'c' in the Irish version of program and four coefficients 'a', 'b', 'c', 'd' in the UK version. The default coefficients are hard-coded in the program and have dimensions: $[a] = l/km$, $[b] = l*h/km2$, $[c]=l*h2/km3$, $[d]= l*h3/km4$. The values for the Irish version are taken from [1], Section C, Table CA.5. It is also possible to enter values 'a', 'b', 'c' in [cents/km], [cents*h/km2], [cents*h2/km3] using the KEY016. In this case the default coefficients will be overwritten with the values from the file, divided by the cost of fuel. The coefficient 'd' cannot be read from the data file. The default values of coefficients in the UK and Irish versions of the program are given in Table A6. The default fuel prices are given in Table A7. The non-fuel vehicle operating costs are taken from [1], Section C, Table CA.6. The non-fuel vehicle operating costs implemented in UK and Irish versions are given in Table A8.

Value of time, accidents, Vehicle Operating Costs (VOC) and growth factors

2.7.　　Default growth factors in COBA are defined on several time intervals. The number of time intervals and the intervals themselves have different values between versions. The guidelines for the Irish time intervals, and growth factor values are taken from [1], Section C, Tables CA.7, CA.8, CA.9. The values used in the UK and Irish versions are presented in Tables A9, A10 and A11. As the fuel consumption rate of change contributes to the VOC growth the fuel consumption rate of change is set to zero in the Irish version as it is shown in Table A12.

Indirect tax rates

2.8.　　The indirect tax rates for the Irish dataset are taken from [1], Section C, Table CA.10. The values of indirect tax rates in the UK and Irish versions are presented in the Table A13.

Changes in indirect tax rates

2.9.　　The values for indirect tax rates changes for the Irish version of COBA are taken from [1], Section C, Table CA.11. The UK and Irish versions datasets are presented in the Table A14.

Seasonality index, E-factor

2.10.　　The default values for Irish seasonality index are taken from [1], Section C, Table CB.1. The default values for the E-factor are taken from [1], Section C, Table CB.2. The guidelines [1] specify values for the following network classes: Motorways (MWY), National Primary (TNB-Trunk non-build up) and National Secondary (PNB -

Principal non-build up). The unspecified network classes, i.e. TBU (Trunk Build Up) and PBU (Principal Build Up) retain UK values for both UK and Irish datasets. The default values of seasonality index and E-factor are given in Table A15.

M-factors

2.11.   The M-factor is calculated using coefficients 'a' and 'b' and the seasonality index. The coefficients 'a' and 'b' in Irish and UK versions are given in Table A16.

Link and junction combined accident rates

2.12.   The Irish version uses 6 accident types specified in the Section C, Table CB.4 [1]. The UK version uses 15 types. Table A17 explains the accident types allowed in each version and the values of accident costs.

Link and junction combined accident proportions

2.13.   The values of casualty severity proportions for the Irish version are specified in the Section C, Table CB.5 [1]. The values of severity proportions together with the accident types allowed in both versions are presented in Table A18. In the revised 2011 version Accident Proportions Change Factors have been introduced (previously the Casualty Per Accident change factor was used to adjust accident proportions). These are given in Table A21a.

Average number of casualties per accident

2.14.   The average number of casualties per accident is set in accordance with the Section C, Table CB.6 [1]. Table A19 presents the default number of casualties used in the Irish and UK versions of COBA.

Accident rate reduction factor, casualties per accident changing factor

2.15.   These magnitudes are set according to Section C, Table CB.7. The Irish and UK versions default values are shown in Tables A20, A21.

Annual average category proportions by class of network

2.16.   The values of this parameter in the Irish version are given in Table CB.8, guidelines [1]. It values are specified for the following network classes: Motorways (MWY), National Primary (TNB-Trunk non-build up) and National Secondary (PNB - Principal non-build up). The network classes which has not been mentioned in the guidelines, i.e. TBU (Trunk Build Up) and PBU (Principal Build Up) retain UK values for both UK and Irish datasets. The values of annual category proportions in each version of the program are given in Table A22. In the revised 2011 version Accident Proportions Change Factors have been introduced (previously the Casualty Per Accident change factor was used to adjust accident proportions). These are given in Table A21a.

Annual vehicle category proportions adjustment factors

2.17.   The adjustment factors of the vehicle category proportions for Irish version are given in [1], Table CB.9, Section C. The changes are specified for MWY, TNB and PNB network classes. The unspecified network classes (TBU, PBU) are initialised with default values from the UK version. The default values used in both versions are given in Table A23.

Vehicle category proportion correction factors

2.18.   The correction factors for the Irish version are taken from guidelines [1], Section C, Table CB.10. The TBU and PBU network classes are initialised with the UK values in the same way as it is done for the parameters described in Sections 2.1.15 and 2.1.16. The values of the correction factors for the vehicle category proportions in the UK and Irish versions are given in Table A24.

Vehicle occupancy rates by flow group and time modes

2.19.   The values for occupancy rate distribution for the Irish version (apart from the flow group 3) are taken from [1], Table CB.11, Section C. The full range of vehicle types and passenger modes existing in COBA, together with the values of occupancy rates in the UK and Irish datasets are presented in Table A25.

Vehicle proportions by time mode and flow group

2.20.   The guidelines for vehicle proportions parameter are given in [1], Section C, Table CB.12. The values of proportions in both versions are presented in the Table A26.

Traffic growth forecast

2.21.   The forecast of traffic growth in Ireland for years 2002-2040 is given in Table CB.13, Section C [1]. For the consideration of the past years the program also needs to have the traffic growth values starting from the year 1991 onwards. The values of traffic growth before year 2002 are the same in the UK and Irish versions. The values and range of years coded into the UK and Irish datasets are gathered in Table A27.

Retail price index

2.22.   The default value of the Retail Price index used in the UK version of COBA is 176.2, in the Irish version it is set to 87.03.

Road classes and speed flow curves

2.23.   Three additional default road classes: 'Dual Carriageway Type 2', '2+1 road with central barrier' and '2+1 road without central barrier' are available in the Irish version of program. To accommodate extra classes the original road class numbering was adjusted as shown in Table A28. Two new speed flow curves were added for the added classes. The speed/flow curve XIII for the 'Type 2' roads is based on original speed flow curve II, with the following adjustments for light vehicles:

   a) The capacity flag (item (3.3) in [2] Part 5, Chapter 3) is changed to:

$$Q_c = \frac{1680}{(1 + 0.015 \cdot PHV)}$$

   b) The constant item (3.5) in [2] Part 5, Chapter 3 is changed to $K_L = 99$

2.24.   The speed/flow curve XIII for '2+1' roads is set as a 5 point speed flow relationship and given in Table A29 and A29a.The default accident types, maintenance types and speed flow curves for both versions of the program are given in Table A28.

Emissions costs

2.25.   The carbon costs in the Irish version are defined for a number of time intervals. The intervals and the values of carbon cost rise per year are given in Table A30.

Accident Under-Reporting

2.26.   The accident under-reporting factor is introduced to the Irish version of the program. The values of under-reporting factor are 'hard-coded' into the program and cannot be changed by the user. In the cost calculations the number of accidents is multiplied by the under-reporting factor assuming that real number of accidents is more than reported to the authorities. The under-reporting factors are set to: 1 for Fatal accidents, 1.5 for Serious accidents and 3.0 for Slight accidents.

3   Changes to the user interface

3.1.   The choice of the default dataset is implemented in the beginning of the program, before the input of user data file name and the output file name. The string 'Key the default dataset (0-England, 1-Ireland):' prompting the user to choose the set of data they are intending to use. After the user has done that, the procedure for running the program is similar to the UK COBA.

3.2.   Since there is different road class numbering and different number of accident types and flow groups in the Irish version of COBA, the data files created for the UK version will produce errors if ran with Irish dataset and vice versa. It is important that the user input data file is appropriate for the version of program they are using

4   Irish COBA testing (the description below refers to the testing carried out for the initial 2007 version)

4.1.   A separate testing task was undertaken. In this testing stage, the implemented functionalities in the Irish COBA were tested with test files to ensure that the results in the new version of the program produces identical results (except where changes are expected) compared to the UK version. The Irish COBA test files and test results are provided separately to this report.

4.2.   Note that these files correspond to the program compiled as executable on the 10th September 2007. Since then a further request has been made by the customer to adjust the weekday and weekend flow groups factors to 1.0 for Irish COBA.

Subsequently no further detailed testing of these changes has been carried out; the customer has suggested they will carry out their own testing to determine the implication of this change. Therefore, the rest of this section discusses the test files used in the original testing i.e. 10th September 2007.

Test that default values have been correctly coded

4.3.   The following files were used:

- Low.dat - the original low.dat file supplied by AECOM
- Lowi.dat - the above file converted to work with Irish version of COBA (some of the road classifications have been changed).
- Lowixx.dat - the above file with the non-mandatory basic data items removed.

4.4.   The following files are intermediate between lowi and lowixx:

lowix1   Key034 removed
lowix2   key033 removed
lowix3   key032 removed
lowix4   key031 removed
lowix5   key030 removed
lowix6   key028 removed
lowix7   key024 removed
lowix8   key 023 removed
lowix9   key 021 removed
lowix10   key020 removed
lowix11   key019 removed
lowix12   key017 removed
lowix13   Key016 removed
lowix14   Key015 removed
lowix15   key014 removed
lowix16   key013 removed
lowix17   key009 removed
lowix18   key008 removed
lowix19   key006 removed

4.5.   Since all the non-mandatory basic data items in lowi should now be coded as defaults in Irish COBA, removing these items one at a time should produce no difference in the results.

4.6.   Therefore, the program was tested by performing runs on files lowi, lowix1, lowix3….through to lowixx. This procedure revealed a number of errors (see test.xls spreadsheet), which were corrected. The final results for lowixx (and any intermediate files) was thought to be acceptably close to those for lowi.

Test that default values can be overwritten

4.7.   The following files are based on lowi but with alterations to the data for an individual key. The program was run with these files and the output checked to make sure that the changes were reflected in the results.

4.8.   Lowik15 (i.e. key 15 changed), lowik16, lowik17, lowik20, lowik21, lowik22, lowik23, lowik24.

Comparing results with UK COBA

4.9.   Irish COBA was run with the data file lowi, and the UK COBA was run with the low data file. The final Present Value of Benefits figures were:

UK COBA run with low	3,729,895
Irish COBA run with lowi	3,590,612

1   References

[1]   Guidelines for cost benefit analysis, June 2005, National Roads Authority.

[2]   COBA Manual.

[3]   Watkiss et al (2005b) - reference provided by AECOM as part of communication on HEATCO carbon costs calculations.

Appendices

Table A1: Key parameters

N	Parameter	Value in Irish version	Value in UK version
1	Present value year	2009	2002
2	Discount rate, per annum	4%	3.5%
3	Appraisal period, years	30	60

Table A2: Maintenance costs.

N	Parameter	Value in UK version, £
1	Maintenance type 1 per km per year	7400
2	Maintenance type 2 per km per year	10400
3	Maintenance type 3 per km per year	12900
4	Maintenance type 4 per km per year	17100
5	Maintenance type 5 per km per year	19500
6	Maintenance type 6 per km per year	19500

N	Parameter	Value in Irish version, €
1	Single Carriageway	18327
2	2+1	30023
3	Dual Carriageway	41178

Table A3: Value of Time (VoT).

N	Parameter		Value in Irish version, c/hour	Value in UK version, p/hour
	Type of vehicle	**Journey purpose**		
1	Car	Working	2781	2083
2	Car	Commuting	1098	417
3	Car	Other	998	368
4	LGV	Working	2781	842
5	LGV	Commuting	1098	417
6	LGV	Other	998	368
7	OGV1	Working	2781	842
8	OGV1	Commuting	0	0
9	OGV1	Other	0	0
10	OGV2	Working	2781	842
11	OGV2	Commuting	0	0
12	OGV2	Other	0	0
13	PSV	Working	2781	1059
14	PSV	Commuting	1098	417
15	PSV	Other	998	368

Table A4: Casualty costs.

N	Parameter	Value in Irish version, €	Value in UK version, £
1	Cost per casualty, Fatality	2069099	1249890
2	Cost per casualty, Serious Injury	231473	140450
3	Cost per casualty, Minor Injury	17850	10830
4	Cost per casualty, Damage only, Urban	0	17.7
5	, Rural	0	7.8
6	, Motorway	0	7.6

Table A5: Accident costs.

Cost Per Accident: Value in Irish version, € (Value in UK version, £)							
Insurance / Administration	**Damage to property**				**Police costs**		
	Urban	Rural		Motorway	Urban	Rural	Motorway
Fatal	378	13999	13999	13999	1835	1835	1835
N 1-7	(230)	(5977)	(10136)	(12894)	(1463)	(1387)	(2030)
Serious	234	6424	6424	6424	252	252	252
N 8-14	(143)	(3203)	(4620)	(11002)	(122)	(341)	(320)
Minor	144	3779	3779	3779	54	54	54
N 15-21	(87)	(1890)	(3063)	(5566)	(44)	(44)	(44)
Damage Only	72	12375	2375	2375	5	5	5
N 22-28	(42)	(1352)	(2019)	(1941)	(3)	(3)	(3)

Table A6: Fuel Vehicle Operating Costs.

Vehicle Category	Coefficients, value in Irish version (value in UK version)			
	a, l/km	**b, l*h/km^2**	**c, l*h^2/km^3**	**d, l*h^3/km^4**
CAR	0.160473178	-0.002686215	1.8233E-05	0
N 1-4	(0.188047641)	(-0.0043794655)	(0.0000506795)	(-0.0000001691)
LGV	0.217687601	-0.003524262	2.82586E-05	0
N 5-8	(0.252461477)	(-0.0048699922)	(0.0000442438)	(-0.0000000753)
OGV1	0.444814203	-0.007185533	5.21836E-05	0
N 9-12	(0.768337515)	(-0.0225730318)	(0.000317658)	(-0.0000013544)
OGV2	0.902911676	-0.014014129	9.55405E-05	0
N 13-16	(1.024431558)	(-0.0302181229)	(0.0004428547)	(-0.0000020059)
PSV	0.724749670	-0.011355478	7.16045E-05	0
N 17-20	(0.634668674)	(-0.0189897027)	(0.000274313)	(-0.0000012161)
DIESEL CAR*	0.160473178	-0.002686215	1.8233E-05	0
N 21-24	(0.140866130)	(-0.002852223)	(0.0000286706)	(-0.0000000693)
DIESEL LGV*	0.217687601	-0.002686215	2.82586E-05	0

| N 25-28 | (0.186375927) | (-0.0026804914) | (0.0000117153) | (0.0000000823) |

* These vehicle categories are considered only in UK version.

Table A7: Fuel prices

N	Parameter	Value in Irish version,€	Value in UK version,£
1	Cost of petrol	0.4476	0.180
2	Cost of diesel	0.4451	0.196

Table A8: Non-fuel vehicle Operating Costs

Vehicle Category	Non- Fuel Parameter values, Irish version (UK version)	
	a^1,cent/km (p/km)	b^1,cent*h/km^2 (p*h/km^2)
CAR N 1-2	6.388 (3.308)	36.783 (19.048)
LGV 3-4	11.413 (5.910)	65.599 (33.97)
OGV1 5-6	10.623 (5.501)	417.431(216.165)
OGV2 7-8	20.666 (10.702)	804.625 (416.165)
PSV 9-10	48.198 (24.959)	1098.877 (569.094)

Table A9: Value of time growth factors

N	Parameter	Value in Irish version			Value in UK version		
1	Number of intervals	8			11		
2	End year of interval 1	2010			2003		
3	End year of interval 2	2011			2004		
4	End year of interval 3	2012			2005		
5	End year of interval 4	2020			2006		
6	End year of interval 5	Not used			2007		
7	End year of interval 6				2008		
8	End year of interval 7				2012		
9	End year of interval 8				2022		
10	End year of interval 9				2032		
11	End year of interval 10				2052		
12	End year of interval 11				2062		
13		Work	Comm.	Other	Work	Comm.	Other
14-16	Time growth for interval 1	0.000	-0.010	-0.010	0.198	0.158	0.158
17-19	Time growth for interval 2	0.000	0.016	0.016	0.0222	0.0178	0.0178
20-22	Time growth for interval 3	0.025	0.020	0.020	0.0321	0.0257	0.0257
23-25	Time growth for interval 4	0.020	0.016	0.016	0.0296	0.0237	0.0237

26-28	Time growth for interval 5			0.0246	0.0197	0.0197
29-31	Time growth for interval 6			0.022	0.0176	0.0176
32-34	Time growth for interval 7		Not used	0.0194	0.0155	0.0155
35-37	Time growth for interval 8			0.0155	0.0124	0.0124
38-40	Time growth for interval 9			0.0199	0.0159	0.0159
41-43	Time growth for interval 10			0.0181	0.0145	0.0145
44-46	Time growth for interval 11			0.02	0.016	0.016

Table A10: Value of accidents growth factors

N	Parameter	Value in Irish version	Value in UK version
1	Number of intervals	8	11
2	End year of interval 1	2003	2003
3	End year of interval 2	2004	2004
4	End year of interval 3	2005	2005
5	End year of interval 4	2006	2006
6	End year of interval 5	Not used	2007
7	End year of interval 6		2008
8	End year of interval 7		2012
9	End year of interval 8		2022
10	End year of interval 9		2032
11	End year of interval 10		2052
12	End year of interval 11		2062
13	Accident growth for interval 1	-0.015	0.0198
14	Accident growth for interval 2	0.020	0.0222
15	Accident growth for interval 3	0.025	0.0321
16	Accident growth for interval 4	0.020	0.0296
17	Accident growth for interval 5		0.0246
18	Accident growth for interval 6		0.022
19	Accident growth for interval 7		0.0194
20	Accident growth for interval 8	Not used	0.0155
21	Accident growth for interval 9		0.0199
22	Accident growth for interval 10		0.0181
23	Accident growth for interval 11		0.02

Table A11: Vehicle operating costs growth rates. Fuel price growth.

N	Parameter	Value in Irish version		Value in UK version	
1	Number of intervals	5		12	
2	End year of interval 1	2010		2002	
3	End year of interval 2	2030		2003	
4	End year of interval 3	Not used		2004	
5	End year of interval 4			2005	
6	End year of interval 5			2006	
7	End year of interval 6			2007	
8	End year of interval 7			2008	
9	End year of interval 8			2009	
10	End year of interval 9			2010	
11	End year of interval 10			2015	
12	End year of interval 11			2020	
13	End year of interval 12			2025	
		Petrol	**Diesel**	**Petrol**	**Diesel**
14-15	Fuel growth at interval 1	0.01	0.01	0.1222	0.1429
16-17	Fuel growth at interval 2	0.00	0.00	-0.1089	-0.1429
18-19	Fuel growth at interval 3	Not used		0.3055	0.3958
20-21	Fuel growth at interval 4			0.0812	0.0653
22-23	Fuel growth at interval 5			-0.0637	-0.063
24-25	Fuel growth at interval 6			-0.0746	-0.0733
26-27	Fuel growth at interval 7			-0.0806	-0.0791
28-29	Fuel growth at interval 8			-0.0693	-0.0679
30-31	Fuel growth at interval 9			0.008	0.0078
32-33	Fuel growth at interval 10			0.086	0.0084
34-35	Fuel growth at interval 11			0	0
36-37	Fuel growth at interval 12			0	0

Table A12: Vehicle operating costs growth rates. Fuel consumption rate change

N	Parameter	Value in Irish version	Value in UK version
1	Number of intervals	7	7
2	End year of interval 1	2002	2002
3	End year of interval 2	2003	2003
4	End year of interval 3	Not Used	2004
5	End year of interval 4		2005
6	End year of interval 5		2010
7	End year of interval 6		2015
8	End year of interval 7		2020
9	Fuel consumption change rate at interval 1 for Petrol Car	-0.02	-0.0074
10	Fuel consumption change rate at interval 2 for Petrol Car	0.00	-0.0075
11	Fuel consumption change rate at interval 3 for Petrol Car	Not used	-0.0076
12	Fuel consumption change rate at interval 4 for Petrol Car		-0.0085
13	Fuel consumption change rate at interval 5 for Petrol Car		-0.0122
14	Fuel consumption change rate at interval 6 for Petrol Car		-0.0148
15	Fuel consumption change rate at interval 7 for Petrol Car		0
16	Fuel consumption change rate at interval 1 for Petrol LGV	0.00	-0.0122
17	Fuel consumption change rate at interval 2 for Petrol LGV	0.00	-0.0156

18	Fuel consumption change rate at interval 3 for Petrol LGV	Not Used	-0.0178
19	Fuel consumption change rate at interval 4 for Petrol LGV		-0.0149
20	Fuel consumption change rate at interval 5 for Petrol LGV		0.0
21	Fuel consumption change rate at interval 6 for Petrol LGV		0.0
22	Fuel consumption change rate at interval 7 for Petrol LGV		0.0
23	Fuel consumption change rate at interval 1 for OGV1	0.00	0.0046
24	Fuel consumption change rate at interval 2 for OGV1	0.00	0.0
25	Fuel consumption change rate at interval 3 for OGV1	Not Used	0.0
26	Fuel consumption change rate at interval 4 for OGV1		-0.0123
27	Fuel consumption change rate at interval 5 for OGV1		0.0
28	Fuel consumption change rate at interval 6 for OGV1		0.0
29	Fuel consumption change rate at interval 7 for OGV1		0.0
30	Fuel consumption change rate at interval 1 for OGV2	0.00	-0.0017
31	Fuel consumption change rate at interval 2 for OGV2	0.00	0.0
32	Fuel consumption change rate at interval 3 for OGV2	Not Used	0.0
33	Fuel consumption change rate at interval 4 for OGV2		-0.0123
34	Fuel consumption change rate at interval 5 for OGV2		0.0
35	Fuel consumption change rate at interval 6 for OGV2		0.0
36	Fuel consumption change rate at interval 7 for OGV2		0.0
37	Fuel consumption change rate at interval 1 for PSV	0.0	0.0
38	Fuel consumption change rate at interval 2 for PSV	0.0	0.0
39	Fuel consumption change rate at interval 3 for PSV	Not Used	0.0
40	Fuel consumption change rate at interval 4 for PSV		0.0
41	Fuel consumption change rate at interval 5 for PSV		0.0
42	Fuel consumption change rate at interval 6 for PSV		0.0
43	Fuel consumption change rate at interval 7 for PSV		0.0
44	Fuel consumption change rate at interval 1 for Diesel Car	-0.02	-0.0118
45	Fuel consumption change rate at interval 2 for Diesel Car	0.00	-0.0119
46	Fuel consumption change rate at interval 3 for Diesel Car	Not used	-0.0121
47	Fuel consumption change rate at interval 4 for Diesel Car		-0.0122
48	Fuel consumption change rate at interval 5 for Diesel Car		-0.012
49	Fuel consumption change rate at interval 6 for Diesel Car		-0.0124
50	Fuel consumption change rate at interval 7 for Diesel Car		0.0
51	Fuel consumption change rate at interval 1 for Diesel LGV	-0.02	0.0097
52	Fuel consumption change rate at interval 2 for Diesel LGV	0.00	-0.014
53	Fuel consumption change rate at interval 3 for Diesel LGV	Not used	-0.0178
54	Fuel consumption change rate at interval 4 for Diesel LGV		-0.0149
55	Fuel consumption change rate at interval 5 for Diesel LGV		0.0
56	Fuel consumption change rate at interval 6 for Diesel LGV		0.0
57	Fuel consumption change rate at interval 7 for Diesel LGV		0.0

Table A13: Indirect tax rates.

N	Parameter	Value in Irish version, %	Value in UK version, %
1	Average tax on final consumption goods, PETROL	19.1	20.9
2	Tax on fuel final consumption, PETROL	159.6	316.5
3	Tax on fuel intermediate consumption, PETROL	113.7	254.4
4	Tax on non-fuel operating cost, final, PETROL	21.5	17.5
5	Tax on non-fuel operating cost, intermediate, PETROL	0.0	0
6	Average tax on final consumption goods, DIESEL	19.1	20.9
7	Tax on fuel final consumption, DIESEL	133.2	292.1
8	Tax on fuel intermediate consumption, DIESEL(except large PSV in Irish version)	91.9	233.7
9	Tax on non-fuel operating cost, final, DIESEL	21.0	17.5
10	Tax on non-fuel operating cost, intermediate, DIESEL	0.0	0
11	Tax on fuel intermediate consumption, DIESEL(large PSV)	133.2	N/A

Table A14: Changes in Indirect tax rates.

N	Parameter	Value in UK version, %
1	Tax rate changes for fuel INTERMEDIATE,PETROL,2003	-13.42
2	Tax rate changes for fuel INTERMEDIATE,PETROL, 2004	12.22
3	Tax rate changes for fuel INTERMEDIATE,PETROL,2005	-25.64
4	Tax rate changes for fuel INTERMEDIATE,PETROL,2006	-9.44
5	Tax rate changes for fuel INTERMEDIATE,PETROL,2007	2.25
6	Tax rate changes for fuel INTERMEDIATE,PETROL,2008-2099	0
7	Tax rate changes for fuel INTERMEDIATE,DIESEL,2003	-14.98
8	Tax rate changes for fuel INTERMEDIATE,DIESEL,2004	16.67
9	Tax rate changes for fuel INTERMEDIATE,DIESEL,2005	-30.45
10	Tax rate changes for fuel INTERMEDIATE,DIESEL,2006	-8.09
11	Tax rate changes for fuel INTERMEDIATE,DIESEL,2007	2.25
12	Tax rate changes for fuel INTERMEDIATE,DIESEL,2008-2099	0
13	Tax rate changes for fuel FINAL,PETROL,2003	-12.68
14	Tax rate changes for fuel FINAL,PETROL,2004	11.45
15	Tax rate changes for fuel FINAL,PETROL,2005	-24.19
16	Tax rate changes for fuel FINAL,PETROL,2006	-8.73
17	Tax rate changes for fuel FINAL,PETROL,2007	2.15
18	Tax rate changes for fuel FINAL,PETROL,2008-2099	0
19	Tax rate changes for fuel FINAL,DIESEL,2003	-14.09
20	Tax rate changes for fuel FINAL,DIESEL,2004	15.5
21	Tax rate changes for fuel FINAL,DIESEL,2005	-28.61
22	Tax rate changes for fuel FINAL,DIESEL,2006	-7.4
23	Tax rate changes for fuel FINAL,DIESEL,2007	2.13
24	Tax rate changes for fuel FINAL,DIESEL,2008-2099	0

N	Parameter	Value in Irish version,%
1	Tax rate changes for fuel INTERMEDIATE,PETROL,2010	6.5
2	Tax rate changes for fuel INTERMEDIATE,PETROL, 2011	0.0
7	Tax rate changes for fuel INTERMEDIATE,DIESEL,2010	5.0
8	Tax rate changes for fuel INTERMEDIATE,DIESEL,2011	0.0
13	Tax rate changes for fuel FINAL,PETROL,2010	10.3
14	Tax rate changes for fuel FINAL,PETROL,2011	0.0
19	Tax rate changes for fuel FINAL,DIESEL,2010	7.9
20	Tax rate changes for fuel FINAL,DIESEL,2011	0.0

Table A15: Default seasonality index and E-factor

N	Parameter	Value in Irish version	Value in UK version
1	Default seasonality index, MWY	1.011	1.060
2	Default seasonality index, TBU	1.058	1.000
3	Default seasonality index, PBU	0.994	1.000
4	Default seasonality index, TNB	1.083	1.100
5	Default seasonality index, PNB	0.981	1.100
6	Default E-factor, MWY	1.218	1.150
7	Default E-factor, TBU	1.180	1.150
8	Default E-factor, PBU	1.184	1.150
9	Default E-factor, TNB	1.175	1.150
10	Default E-factor, PNB	1.217	1.150

Table A16: Default M-factor coefficients.

N	Parameter	Value in Irish version	Value in UK version
1-2	'a' and 'b' coefficients January	a=130, b=272	a=126, b=276
3-4	'a' and 'b' coefficients February	a=141, b=233	a=105, b=261
5-6	'a' and 'b' coefficients March	a=227, b=147	a=149, b=244
7-8	'a' and 'b' coefficients April	a=306, b=57	a=287, b=73
9-10	'a' and 'b' coefficients May	a=339, b=20	a=316, b=33
11-12	'a' and 'b' coefficients June	a=419, b=-55	a=408, b=57
13-14	'a' and 'b' coefficients July	a=540, b=-174	a=512, b=163
15-16	'a' and 'b' coefficients August	a=627, b=-265	a=639, b=287
17-18	'a' and 'b' coefficients September	a=363, b=-4	a=445, b=102
19-20	'a' and 'b' coefficients October	a=251, b=110	a=297, b=61
21-22	'a' and 'b' coefficients November	a=115, b=247	a=268, b=121
23-24	'a' and 'b' coefficients December	a=153, b=252	a=285, b=130

Table A17: Link and Junction Combined Accident Rates

N	Accident type	ROAD TYPE, UK version (Irish version)	Accident Rate PIA/ mvkm, UK version (Irish version)	
1	1*	D2 Motorway (Motorway)	0.098 (0.026)	
2	2	D3 Motorway	0.098	
3	3	D4 Motorway	0.098	
			≤60 kph	≥60kph
4	4*	Modern S2 Road (2 Lane Single Carriageway)	0.844 (0.202)	0.293(0.111)
5	5*	Modern S2 Road with H/S (2+1 without Central Reserve Barrier)	0.844 (0.177)	0.232(0.098)
6	6	Modern WS2 Roads	0.844	0.190
7	7	Modern WS2 Roads with H/S	0.844	0.171
8	8*	Older S2 A Roads (1 Way)	0.844 (0.148)	0.381 (0.0)
9	9	Other S2 Roads	0.844	0.404
10	10*	Modern D2 Roads (Dual Carriageway)	1.044 (0.144)	0.174 (0.056)
11	11*	Modern D2 Roads with H/S (2+1 with Central Reserve Barrier)	1.004 (0.155)	0.131 (0.084)
12	12	Older D2 Roads	1.004	0.226
13	13	Modern D3+ Roads	1.004	0.174
14	14	Modern D3+ Roads with H/S	1.004	0.131
15	15	Older D3+ Roads	1.004	0.226

* Accident types allowed in Irish version.

Table A18: Link and Junction Combined Accident Proportions

N	Accident type	ROAD TYPE, UK version (Irish version)	Casualty severity proportions**: Fatal, Serious. UK version (Irish version)	
1	1*	D2 Motorway (Motorway)	0.013,0.093 (0.091,0.091)	
2	2	D3 Motorway	0.013,0.093	
3	3	D4 Motorway	0.013,0.093	
			≤60 kph	≥60kph
4	4*	Modern S2 Road (2 Lane Single Carriageway)	0.013,0.146 (0.049, 0.101)	0.038, 0.207 (0.093, 0.140)
5	5*	Modern S2 Road with H/S (2+1 without Central Reserve Barrier)	0.013,0.146 (0.056, 0.100)	0.038, 0.207 (0.105, 0.138)
6	6	Modern WS2 Roads	0.013,0.146	0.038, 0.207
7	7	Modern WS2 Roads with H/S	0.013,0.146	0.038, 0.207
8	8*	Older S2 A Roads (1 Way)	0.013,0.146 (0.049, 0.101)	0.038, 0.207 (0.0, 0.0)
9	9	Other S2 Roads	0.007, 0.126	0.024, 0.198
10	10*	Modern D2 Roads (Dual Carriageway)	0.009, 0.113 (0.022, 0.081)	0.025, 0.148 (0.068, 0.088)
11	11*	Modern D2 Roads with H/S (2+1 with Central Reserve Barrier)	0.009, 0.113 (0.034, 0.175)	0.025, 0.148 (0.066, 0.254)
12	12	Older D2 Roads	0.009, 0.113	0.025, 0.148
13	13	Modern D3+ Roads	0.009, 0.113	0.025, 0.148
14	14	Modern D3+ Roads with H/S	0.009, 0.113	0.025, 0.148
15	15	Older D3+ Roads	0.009, 0.113	0.025, 0.148

* - Accident types allowed in Irish version.

** - The proportion of minor casualties is calculated by program as 1-(Fatal + Serious)

Table A19: Average number of casualties per accident

N	Accident type	ROAD TYPE: UK version (Irish version)	Casualties per PIA: Fatal, Serious, Minor. UK version (Irish version)	
1	1*	D2 Motorway (Motorway)	0.022,0.152,1.462 (0.099,0.116,1.194)	
2	2	D3 Motorway	0.022,0.152,1.462	
3	3	D4 Motorway	0.022,0.152,1.462	
			≤60 kph	≥60kph
4	4*	Modern S2 Road (2 Lane Single Carriageway)	0.0092,0.1392,1.157 (0.057,0.132,1.140)	0.0436,0.2855,1.286 (0.106,0.219,1.295)
5	5*	Modern S2 Road with H/S (2+1 without Central Reserve Barrier)	0.0092,0.1392,1.157 (0.057,0.132,1.140)	0.0436,0.2855,1.286 (0.106,0.219,1.295)
6	6	Modern WS2 Roads	0.0092,0.1392,1.157	0.0436,0.2855,1.286
7	7	Modern WS2 Roads with H/S	0.0092,0.1392,1.157	0.0436,0.2855,1.286
8	8*	Older S2 A Roads (1 Way)	0.0092,0.1392,1.157 (0.057,0.132,1.140)	0.0436,0.2855,1.286 (0.0,0.0,0.0)
9	9	Other S2 Roads	0.0075,0.1379,1.124	0.0262,0.2513,1.245
10	10*	Modern D2 Roads (Dual Carriageway)	0.0093,0.1253,1.222 (0.025, 0.098, 1.196)	0.0286,0.1861,1.314 (0.075,0.104,1.202)
11	11*	Modern D2 Roads with H/S (2+1 with Central Reserve Barrier)	0.0093,0.1253,1.222 (0.025, 0.098, 1.196)	0.0286,0.1861,1.314 (0.075,0.104,1.202)
12	12	Older D2 Roads	0.0093,0.1253,1.222	0.0286,0.1861,1.314
13	13	Modern D3+ Roads	0.0093,0.1253,1.222	0.0286,0.1861,1.314
14	14	Modern D3+ Roads with H/S	0.0093,0.1253,1.222	0.0286,0.1861,1.314
15	15	Older D3+ Roads	0.0093,0.1253,1.222	0.0286,0.1861,1.314

* - Accident types allowed in Irish version.

Table A20: Accident rate reduction factor.

N	Accident type	ROAD TYPE: UK name (Irish name)	Accident rate reduction factor: Fatal, Serious, Minor. UK version (Irish version)	
1	1*	D2 Motorway (Motorway)	1.001 (0.960)	
2	2	D3 Motorway	1.001	
3	3	D4 Motorway	1.001	
4	4*	Modern S2 Road (2 Lane Single Carriageway)	0.984 (0.987)	0.973 (0.966)
5	5*	Modern S2 Road with H/S (2+1 without Central Reserve Barrier)	0.984 (0.987)	0.973 (0.966)
6	6	Modern WS2 Roads	0.984	0.973
7	7	Modern WS2 Roads with H/S	0.984	0.973
8	8*	Older S2 A Roads (1 Way)	0.984 (0.987)	0.973 (0.966)
9	9	Other S2 Roads	0.983	0.998
10	10*	Modern D2 Roads (Dual Carriageway)	0.984 (0.987)	0.973 (0.966)
11	11*	Modern D2 Roads with H/S (2+1 with Central Reserve Barrier)	0.984 (0.987)	0.973 (0.966)
12	12	Older D2 Roads	0.984	0.973
13	13	Modern D3+ Roads	0.984	0.973
14	14	Modern D3+ Roads with H/S	0.984	0.973
15	15	Older D3+ Roads	0.984	0.973

* - Accident types allowed in Irish version.

Table A21: Casualties per accident change factor

N	Accident type	ROAD TYPE: UK name (Irish name)	Casualties per accident change factor: Fatal, Serious and Minor. UK version (Irish version)	
1	1*	D2 Motorway (Motorway)	0.960, 0.946, 1.010 (1.012,0.954,0.994)	
2	2	D3 Motorway	0.960, 0.946, 1.010	
3	3	D4 Motorway	0.960, 0.946, 1.010	
4	4*	Modern S2 Road (2 Lane Single Carriageway)	0.954,0.964,1.010 (1.010, 0.932, 0.989)	0.988,0.975,1.005 (0.988, 0.929, 0.993)
5	5*	Modern S2 Road with H/S (2+1 without Central Reserve Barrier)	0.954,0.964,1.010 (1.010, 0.932, 0.989)	0.988,0.975,1.005 (0.988, 0.929, 0.993)
6	6	Modern WS2 Roads	0.954,0.964,1.010	0.988,0.975,1.005
7	7	Modern WS2 Roads with H/S	0.954,0.964,1.010	0.988,0.975,1.005
8	8*	Older S2 A Roads (1 Way)	0.954,0.964,1.010 (1.010, 0.932, 0.989)	0.988,0.975,1.005 (0.988, 0.929, 0.993)
9	9	Other S2 Roads	0.973,0.961,1.011	0.985,0.973,1.008
10	10*	Modern D2 Roads (Dual Carriageway)	0.956,0.958,1.012 (1.010, 0.932, 0.989)	0.949,0.961,1.007 (0.988, 0.929, 0.993)
11	11*	Modern D2 Roads with H/S (2+1 with Central Reserve Barrier)	0.956,0.958,1.012 (1.010, 0.932, 0.989)	0.949,0.961,1.007 (0.988, 0.929, 0.993)
12	12	Older D2 Roads	0.956,0.958,1.012	0.949,0.961,1.007
13	13	Modern D3+ Roads	0.956,0.958,1.012	0.949,0.961,1.007
14	14	Modern D3+ Roads with H/S	0.956,0.958,1.012	0.949,0.961,1.007
15	15	Older D3+ Roads	0.956,0.958,1.012	0.949,0.961,1.007

* - Accident types allowed in Irish version.

Table A21a: Accident Proportions Change Factor

N	Accident type	ROAD TYPE: UK name (Irish name)	Casualties per accident change factor: Fatal, Serious and Minor. (Irish version)	
1	1*		1.053,0.954	
4	4*	Modern S2 Road (2 Lane Single Carriageway)	0.994,0.939	0.996,0.932
5	5*	Modern S2 Road with H/S (2+1 without Central Reserve Barrier)	0.994,0.939	0.996,0.932
8	8*	Older S2 A Roads (1 Way)	0.994,0.939	0.996,0.932
10	10*	Modern D2 Roads (Dual Carriageway)	0.994,0.939	0.996
11	11*	Modern D2 Roads with H/S (2+1 with Central Reserve Barrier)	0.994,0.939	0.996

* - Accident types allowed in Irish version.

Table A22: Annual average category proportions by class of network.

N	Parameter	Network class	Value in UK version	Value in Irish version
1	Annual average proportion of category 'CARS'	Motorway (MWY)	0.762	0.804
2	Annual average proportion of category 'LGV'		0.107	0.081
3	Annual average proportion of category 'OGV1'		0.041	0.044
4	Annual average proportion of category 'OGV2'		0.085	0.065
5	Annual average proportion of category 'PSV'		0.005	0.005
6	Annual average proportion of category 'CARS'	Trunk Non-Build Up (TNB)	0.787	0.828
7	Annual average proportion of category 'LGV'		0.11	0.074
8	Annual average proportion of category 'OGV'		0.038	0.039
9	Annual average proportion of category 'OGV2'		0.059	0.052
10	Annual average proportion of category 'PSV'		0.006	0.007
11	Annual average proportion of category 'CARS'	Principal Non-Build Up (PNB)	0.826	0.833
12	Annual average proportion of category 'LGV'		0.113	0.082
13	Annual average proportion of category 'OGV'		0.031	0.043
14	Annual average proportion of category 'OGV2'		0.022	0.038
15	Annual average proportion of category 'PSV'		0.008	0.005
16	Annual average proportion of category 'CARS'	Trunk Build Up (TBU)	0.825	0.825
17	Annual average proportion of category 'LGV'		0.112	0.112
18	Annual average proportion of category 'OGV'		0.030	0.030
19	Annual average proportion of category 'OGV2'		0.024	0.024
20	Annual average proportion of category 'PSV'		0.009	0.009
21	Annual average proportion of category 'CARS'	Principal Build Up (PBU)	0.848	0.848
22	Annual average proportion of category 'LGV'		0.103	0.103
23	Annual average proportion of category 'OGV'		0.022	0.022
24	Annual average proportion of category 'OGV2'		0.010	0.010
25	Annual average proportion of category 'PSV'		0.017	0.017

Table A23: Annual vehicle category proportions adjustment factors

N	Network class	Period of neutral month weekday count	Parameter	Value in UK version	Value in Irish version
1	Motorway (MWY)	12 HOUR	Adjustment factor for LGV	0.860	0.903
2			Adjustment factor for OGV1	0.800	0.796
3			Adjustment factor for OGV2	0.840	1.004
4			Adjustment factor for PSV	1.190	1.032
5		16 HOUR	Adjustment factor for LGV	0.890	0.937
6			Adjustment factor for OGV1	0.840	0.863
7			Adjustment factor for OGV2	0.830	1.004
8			Adjustment factor for PSV	1.160	1.051
9	Trunk Build Up (TBU)	12 HOUR	Adjustment factor for LGV	0.830	0.830
10			Adjustment factor for OGV1	0.730	0.730
11			Adjustment factor for OGV2	0.750	0.750
12			Adjustment factor for PSV	0.900	0.900
13		16 HOUR	Adjustment factor for LGV	0.890	0.890
14			Adjustment factor for OGV1	0.810	0.810
15			Adjustment factor for OGV2	0.790	0.790
16			Adjustment factor for PSV	0.920	0.920
17	Principal Build Up (PBU)	12 HOUR	Adjustment factor for LGV	0.830	0.830
18			Adjustment factor for OGV1	0.730	0.730
19			Adjustment factor for OGV2	0.750	0.750
20			Adjustment factor for PSV	0.900	0.900
21		16 HOUR	Adjustment factor for LGV	0.890	0.890
22			Adjustment factor for OGV1	0.810	0.810
23			Adjustment factor for OGV2	0.790	0.790
24			Adjustment factor for PSV	0.920	0.920
25	Trunk Non-Build Up (TNB)	12 HOUR	Adjustment factor for LGV	0.840	0.826
26			Adjustment factor for OGV1	0.770	0.828
27			Adjustment factor for OGV2	0.840	0.970
28			Adjustment factor for PSV	0.980	1.041
29		16 HOUR	Adjustment factor for LGV	0.890	0.850
30			Adjustment factor for OGV1	0.820	0.877
31			Adjustment factor for OGV2	0.830	0.976
32			Adjustment factor for PSV	0.890	1.051
33	Principal Non-Build Up (PNB)	12 HOUR	Adjustment factor for LGV	0.840	0.886
34			Adjustment factor for OGV1	0.770	0.839
35			Adjustment factor for OGV2	0.840	1.109
36			Adjustment factor for PSV	0.980	0.632
37		16 HOUR	Adjustment factor for LGV	0.890	0.921
38			Adjustment factor for OGV1	0.820	0.897
39			Adjustment factor for OGV2	0.830	1.158
40			Adjustment factor for PSV	0.890	0.678

Table A24: Vehicle category proportion correction factors.

N	Network class	Flow group	Parameter	Value in Irish version
1		2	Correction factor for LGV	1.193
2			Correction factor for OGV1	1.305
3			Correction factor for OGV2	1.270
4			Correction factor for PSV	1.116
5		3	Correction factor for LGV	1.082
6			Correction factor for OGV1	1.015
7			Correction factor for OGV2	0.895
8			Correction factor for PSV	0.880
9		4	Correction factor for LGV	1.036
10			Correction factor for OGV1	0.854
11			Correction factor for OGV2	0.713
12			Correction factor for PSV	0.781
13	Motorway	7	Correction factor for LGV	0.640
14			Correction factor for OGV1	0.514
15			Correction factor for OGV2	0.361
16			Correction factor for PSV	0.852
17		8	Correction factor for LGV	0.598
18			Correction factor for OGV1	0.430
19			Correction factor for OGV2	0.273
20			Correction factor for PSV	0.706
21		9	Correction factor for LGV	0.588
22			Correction factor for OGV1	0.420
23			Correction factor for OGV2	0.271
24			Correction factor for PSV	0.691
25		2	Correction factor for LGV	1.168
26			Correction factor for OGV1	1.211
27			Correction factor for OGV2	1.319
28			Correction factor for PSV	1.072
29		3	Correction factor for LGV	1.102
30			Correction factor for OGV1	1.045
31			Correction factor for OGV2	0.958
32			Correction factor for PSV	0.908
33		4	Correction factor for LGV	1.030
24	National pimary (TNB)		Correction factor for OGV1	0.907
35			Correction factor for OGV2	0.727
36			Correction factor for PSV	0.838
37		7	Correction factor for LGV	0.675
38			Correction factor for OGV1	0.621
39			Correction factor for OGV2	0.312
40			Correction factor for PSV	1.065
41		8	Correction factor for LGV	0.624
42			Correction factor for OGV1	0.569
43			Correction factor for OGV2	0.224
44			Correction factor for PSV	0.775
45		9	Correction factor for LGV	0.619
46			Correction factor for OGV1	0.563
47			Correction factor for OGV2	0.198
48			Correction factor for PSV	0.826

49		2	Correction factor for LGV	1.147
50			Correction factor for OGV1	1.237
51			Correction factor for OGV2	1.238
52			Correction factor for PSV	1.122
53		3	Correction factor for LGV	1.082
54			Correction factor for OGV1	1.180
55			Correction factor for OGV2	0.967
56			Correction factor for PSV	0.916
57		4	Correction factor for LGV	1.030
58			Correction factor for OGV1	1.026
59	Mational pimary (TBU)		Correction factor for OGV2	0.753
60			Correction factor for PSV	0.805
61		7	Correction factor for LGV	0.698
62			Correction factor for OGV1	0.691
63			Correction factor for OGV2	0.268
64			Correction factor for PSV	0.877
65		8	Correction factor for LGV	0.666
66			Correction factor for OGV1	0.741
67			Correction factor for OGV2	0.224
68			Correction factor for PSV	0.775
69		9	Correction factor for LGV	0.680
70			Correction factor for OGV1	0.745
71			Correction factor for OGV2	0.198
72			Correction factor for PSV	0.790
73		2	Correction factor for LGV	1.158
74			Correction factor for OGV1	1.300
75			Correction factor for OGV2	1.358
76			Correction factor for PSV	1.080
77		3	Correction factor for LGV	1.112
78			Correction factor for OGV1	1.126
79			Correction factor for OGV2	1.049
80			Correction factor for PSV	1.048
81		4	Correction factor for LGV	1.049
82			Correction factor for OGV1	0.898
83			Correction factor for OGV2	0.783
84	National secondary (PNB)		Correction factor for PSV	0.968
85		7	Correction factor for LGV	0.680
86			Correction factor for OGV1	0.500
87			Correction factor for OGV2	0.300
88			Correction factor for PSV	1.015
89		8	Correction factor for LGV	0.640
90			Correction factor for OGV1	0.441
91			Correction factor for OGV2	0.255
92			Correction factor for PSV	0.930
93		9	Correction factor for LGV	0.611
94			Correction factor for OGV1	0.399
95			Correction factor for OGV2	0.217
96			Correction factor for PSV	0.866

		2	Correction factor for LGV	1.169
97		2	Correction factor for LGV	1.169
98			Correction factor for OGV1	1.408
99			Correction factor for OGV2	1.394
100			Correction factor for PSV	1.124
101		3	Correction factor for LGV	1.072
102			Correction factor for OGV1	1.074
103			Correction factor for OGV2	0.944
104			Correction factor for PSV	1.015
105		4	Correction factor for LGV	1.046
106	National secondary (PBU)		Correction factor for OGV1	0.966
107			Correction factor for OGV2	0.817
108			Correction factor for PSV	0.899
109		7	Correction factor for LGV	0.671
110			Correction factor for OGV1	0.498
111			Correction factor for OGV2	0.274
112			Correction factor for PSV	0.853
113		8	Correction factor for LGV	0.635
114			Correction factor for OGV1	0.429
115			Correction factor for OGV2	0.218
116			Correction factor for PSV	0.800
117		9	Correction factor for LGV	0.580
118			Correction factor for OGV1	0.381
119			Correction factor for OGV2	0.168
120			Correction factor for PSV	0.721

Table A25: Vehicle Occupancy rates, by Flow Group and Time Modes

N	Vehicle Mode	Person Mode	Vehicle occupancy rates by flow group: Value in Irish version (							
			1	2	3	4	5	6	7	8
1-4	Working Car	Work	1.24	1.25	1.26	1.26	1.33	1.34	1.38	1.38
5-8		Commuting	0	0	0	0	0	0	0	0
9-12		Other non-work	0	0	0	0	0	0	0	0
13-16	Commuting Car	Work	0	0	0	0	0	0	0	0
17-20		Commuting	1.21	1.22	1.23	1.23	1.20	1.23	1.22	1.22
21-24		Other non-work	0	0	0	0	10	0	0	0
25-28	Non-Working Car	Work	0	0	0	0	0	0	0	0
29-32		Commuting	0	0	0	0	0	0	0	0
33-36		Other non-work	1.64	1.65	1.66	1.68	1.70	1.83	1.85	1.85
37-40	Working LGV	Work	1.36	1.32	1.37	1.37	1.42	1.42	1.42	1.42
41-44		Commuting	0	0	0	0	0	0	0	0
45-48		Other non-work	0	0	0	0	0	0	0	0

49-52	Commuting LGV	Work	0	0	0	0	0	0	0	0
53-56		Commuting	1.40	1.41	1.40	1.95	1.95	1.95	1.95	1.95
57-60		Other non-work	0	0	0	0	0	0	0	0
61-64	Non-working LGV	Work	0	0	0	0	0	0	0	0
65-68		Commuting	0	0	0	0	0	0	0	0
69-72		Other non-work	1.47	1.45	1.49	1.48	2.05	2.05	2.05	2.05
73-76	Working OGV1	Work	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09
77-80		Commuting	0	0	0	0	0	0	0	0
81-84		Other non-work	0	0	0	0	0	0	0	0
85-88	Commuting OGV1	Work	0	0	0	0	0	0	0	0
89-92		Commuting	1.25	1.28	1.24	1.24	1.25	1.25	1.25	1.25
93-96		Other non-work	0	0	0	0	0	0	0	0
97-100	Non-working OGV1	Work	0	0	0	0	0	0	0	0
101-104		Commuting	0	0	0	0	0	0	0	0
105-108		Other non-work	1.29	1.33	1.26	1.27	1.29	1.29	1.29	1.29
109-112	Working OGV2	Work	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03
113-116		Commuting	0	0	0	0	0	0	0	0
117-120		Other non-work	0	0	0	0	0	0	0	0
121-124	Commuting OGV2	Work	0	0	0	0	0	0	0	0
125-128		Commuting	1.11	1.14	1.11	1.08	1.11	1.11	1.11	1.11
129-132		Other non-work	0	0	0	0	0	0	0	0
133-136	Non-working OGV2	Work	0	0	0	0	0	0	0	
137-140		Commuting	0	0	0	0	0	0	0	0
141-144		Other non-work	1.13	1.12	1.11	1.16	1.13	1.13	1.13	1.13
145-148	Working PSV	Work	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35
149-152		Commuting	0	0	0	0	0	0	0	0

153-156		Other non-work	0	0	0	0	0	0	0	0
157-160	Commuting PSV	Work	0	0	0	0	0	0	0	0
161-164		Commuting	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
165-168		Other non-work	0	0	0	0	0	0	0	0
169-172	Non-working PSV	Work	0	0	0	0	0	0	0	0
173-176		Commuting	0	0	0	0	0	0	0	0
177-180		Other non-work	9.35	9.35	9.35	9.35	9.35	9.35	9.35	9.35

Table A26: Vehicle Proportions by Time Mode and Flow Group

N	Vehicle Mode	Vehicle proportions* by time mode and flow group: Value in UK version (Value in Irish version)			
		1	2	3	4
1-4	Working Car	0.12 (0.10)	0.185 (0.22)	0.160 (0.34)	0.147 (0.11)
5-8	Commuting Car	0.36 (0.32)	0.25 (0.20)	0.328 (0.33)	0.477 (0.58)
9-12	Other Non Working Car	0.52 (0.58)	0.565 (0.58)	0.512 (0.33)	0.376 (0.31)
13-16	Working LGV	0.880 (0.880)			
17-20	Commuting LGV	0.026 (0.026)			
21-24	Non-working LGV	0.094 (0.094)			
25-28	Working OGV1	1.0 (1.0)			
29-32	Commuting OGV1	0.0 (0.0)			
33-36	Other Non Working OGV1	0.0 (0.0)			
37-40	Working OGV2	1.0 (1.0)			
41-44	Commuting OGV2	0.0 (0.0)			
45-48	Other Non Working OGV2	0.0 (0.0)			
49-52	Working PSV	1.0 (1.0)			
53-56	Commuting PSV	0.0 (0.0)			
57-60	Other Non Working PSV	0.0 (0.0)			

* - Proportions within flow group must sum to one

Table A27: Traffic Growth Forecasts: Percentage Growth Per Year

Years	Traffic growth, percentage growth per year: UK version (Irish version)									
	Cars		LGV		OGV1		OGV2		PSV	
	Low	High	Low	High	Low	High	Low	High	Low	High
1991	-0.2 (-0.2)	-0.2 (-0.2)	4.5 (4.5)	4.5 (4.5)	-2.7 (-2.7)	-2.7 (-2.7)	0.0 (0.0)	0.0 (0.0)	4.3 (4.3)	4.3 (4.3)
1992	0.8 (0.8)	0.8 (0.8)	-1.2 (-1.2)	-1.2 (-1.2)	-2.1 (-2.1)	-2.1 (-2.1)	-4.0 (-4.0)	-4.0 (-4.0)	-4.2 (-4.2)	-4.2 (-4.2)
1993	0.1 (0.1)	0.1 (0.1)	-0.2 (-0.2)	-0.2 (-0.2)	-0.7 (-0.7)	-0.7 (-0.7)	1.0 (1.0)	1.0 (1.0)	0.0 (0.0)	0.0 (0.0)
1994	2.1 (2.1)	2.1 (2.1)	4.2 (4.2)	4.2 (4.2)	0.9 (0.9)	0.9 (0.9)	3.4 (3.4)	3.4 (3.4)	1.0 (1.0)	1.0 (1.0)
1995	1.8 (1.8)	1.8 (1.8)	2.7 (2.7)	2.7 (2.7)	0.8 (0.8)	0.8 (0.8)	4.5 (4.5)	4.5 (4.5)	5.0 (5.0)	5.0 (5.0)
1996	2.7 (2.7)	2.7 (2.7)	4.0 (4.0)	4.0 (4.0)	2.4 (2.4)	2.4 (2.4)	4.3 (4.3)	4.3 (4.3)	2.6 (2.6)	2.6 (2.6)
1997	1.5 (1.5)	1.5 (1.5)	4.9 (4.9)	4.9 (4.9)	0.4 (0.4)	0.4 (0.4)	3.7 (3.7)	3.7 (3.7)	1.6 (1.6)	1.6 (1.6)
1998	1.5 (1.5)	1.5 (1.5)	4.8 (4.8)	4.8 (4.8)	3.4 (3.4)	3.4 (3.4)	4.1 (4.1)	4.1 (4.1)	0.7 (0.7)	0.7 (0.7)
1999	1.5 (1.5)	1.5 (1.5)	1.3 (1.3)	1.3 (1.3)	1.5 (1.5)	1.5 (1.5)	0.2 (0.2)	0.2 (0.2)	-0.1 (-0.1)	-0.1 (-0.1)
2000	-0.2 (-0.2)	-0.2 (-0.2)	1.4 (1.4)	1.4 (1.4)	0.7 (0.7)	0.7 (0.7)	0.1 (0.1)	0.1 (0.1)	-2.1 (-2.1)	-2.1 (-2.1)
2001	1.6 (1.6)	1.6 (1.6)	2.6 (2.6)	2.6 (2.6)	-1.3 (-1.3)	-1.3 (-1.3)	-0.3 (-0.3)	-0.3 (-0.3)	0.1 (0.1)	0.1 (0.1)
2002-2006 (2002-2007)	1.65(2.9986)	2.69(4.1873)	2.27(2.9986)	3.93(4.1873)	0.77(2.7019)	1.76(3.7812)	2.55(2.7019)	3.68(3.7812)	0.68(0.340)	1.72(0.982)
2007-2011 (2008-2012)	1.46(2.1666)	1.95(2.8838)	2.17(2.1666)	2.58(2.8838)	0.80(2.2771)	1.07(3.0434)	2.44(2.2771)	2.85(3.0434)	0.69(0.354)	0.98(1.006)
2012-2016 (2013-2017)	1.37(1.5036)	1.76(1.9434)	2.29(1.5036)	2.48(1.9434)	0.91(1.5841)	1.10(2.0519)	2.52(1.5841)	2.74(2.0519)	0.77(0.428)	0.99(1.090)
2017-2021 (2018-2022)	1.01(1.2258)	1.67(1.5538)	2.21(1.2258)	2.59(1.5538)	0.94(1.4757)	1.20(1.8707)	2.39(1.4757)	2.82(1.8707)	0.87(0.518)	1.07(1.190)
2022-2026 (2023-2027)	0.69(0.9215)	1.31(1.2012)	2.06(0.9215)	2.51(1.2012)	0.99(1.3714)	1.24(1.7593)	2.27(1.3714)	2.69(1.7593)	0.97(0.604)	1.17(1.288)
2027-2031 (2028-2032)	0.67(0.6767)	0.98(0.9047)	1.89(0.6767)	2.36(0.9047)	1.0(1.2671)	1.29(1.6281)	2.13(1.2671)	2.58(1.6281)	1.06(0.660)	1.27(1.360)
2031-Later (2031-2037)	0.0(0.5340)	0.97(0.7274)	0.0(0.5340)	2.19(0.7274)	0.0(1.1626)	1.30(1.4897)	0.0(1.1626)	2.44(1.4897)	0.0(0.660)	1.36(1.360)
(2038-2040)	(0.4542)	(0.6289)	(0.4542)	(0.6289)	(1.0790)	(1.3817)	(1.0790)	(1.3817)	(0.660)	(1.360)
(2041-Later)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)

Table A28: Road class layout in UK and Irish versions of COBA

UK VERSION ROAD CLASSES					IRISH VERSION ROAD CLASSES					
Road class number	UK class name	Default maintenance type	Default accident type	Default speed/flow curve	class Road number	Irish class name	Default maintenance type	Default accident type	Allowed accident type	Default speed/flow curve
1	Rural single carriageway	1	4 - 9	I	1	Rural All Purpose Single Carriageway	1	4	4-9	I
2	Rural all-purpose dual 2-lane carriageway	2	10-12	II	2	Rural All Purpose Dual Carriageway	3	10	10-12	II
3	Rural all-purpose dual 3 or more lane carriageway		13 -20	III	3	Rural All Purpose Dual Carriageway 'Type 2'	3	10	10-12	XII
4	Motorway, dual 2-lanes	4	1	IV	4	Rural all-purpose dual 3 or more lane carriageway	3	10	13-20	III
5	Motorway, dual 3-lanes	5	2	V	5	2 x 2 Motorway	3	1	1-3	IV
6	Motorway, dual 4 or more lanes	6	3	VI	6	3 x 3 Motorway	3	1	1-3	V
7	Urban, non-central	1, 2, 3	4 - 20	VII	7	4 x 4 Motorway	3	3	1-3	VI
8	Urban, central	1, 2, 3	4 - 20	VIII	8	Urban all-purpose dual carriageway (central)	3	10	4-20	VIII
9	Small town	1, 2, 3	4 - 20	IX	9	Urban all-purpose dual carriageway (non-central)	3	10	4-20	VII
10	Suburban single carriage way	1	4 - 20	X	8	Urban all-purpose single carriageway (central)	1	4	4-20	VIII
11	Suburban dual carriage way	2 or 3	10- 20	XI	9	Urban all-purpose single carriageway (non-central)	1	4	4-20	VII
12			13- 20		10	Small town all-purpose dual carriageway	3	10	4-20	IX
13	User defined all vehicle relationships (KEY 026)		13-20		10	Small town all-purpose single carriageway	1	4	4-20	IX
14			13-20		11	Suburban all-purpose dual carriageway	3	10	4-20	XI
15			4-9		12	Suburban all-purpose single carriageway	3	4	4-20	X
16			10-12		13	2+1' road with central safety barrier	2	11	4-20	XIII
17	User defined light/heavy vehicle relationship (KEY027)		1-20		14	2+1' road without central safety barrier	2	5	4-20	XIII
18			1-20		15				1-20	
19			1-20		16	User defined all vehicle relationships (KEY 026)			1-20	
20			1-20		17				1-20	
					18	User defined light/heavy vehicle relationship (KEY027)			4-9	
					19				10-12	
					20				1-20	

Table A29: Speed Flow curve XIII for 2+1 Roads (Light vehicles)

N	Parameter	Value
1	COBA Road Class	13 or 14
2	Free Speed	87.11 kph
3	Slope 1	0.0363
4	Flow Break Point	1500 vehs/hr/lane
5	Slope 2	0.08
6	Minimum Speed	40 kph

Table A29a: Speed Flow curve XIII for 2+2 Roads (Heavy vehicles).

N	Parameter	Value
1	COBA Road Class	13 or 14
2	Free Speed	65 kph
3	Slope	0
4	Minimum Speed	40 kph

Table A30: Emissions Cost Increases

N	Parameter	GHG Increases(%)
1	Number of time intervals	4
2	Time interval 1	2010
3	Time interval 2	2011
4	Time interval 3	2012
5	Time interval 4	2020+
6	Carbon costs rise at interval 1 per year	-1.5
7	Carbon costs rise at interval 2 per year	2.0
8	Carbon costs rise at interval 3 per year	2.5
9	Carbon costs rise at interval 4 per year	2.0

N	Parameter	Non GHG Increases
1	Number of time intervals	7
2	Time interval 1	2009
3	Time interval 2	2010
4	Time interval 3	2011
5	Time interval 4	2012
6	Time interval 5	2013
7	Time interval 6	2014
8	Time interval 7	2015
9	Carbon costs rise at interval 1 per year	5.4
10	Carbon costs rise at interval 2 per year	5.1
11	Carbon costs rise at interval 3 per year	6.5
12	Carbon costs rise at interval 4 per year	7.0
13	Carbon costs rise at interval 5 per year	7.1

| 14 | Carbon costs rise at interval 6 per year | 117.2 |
| 15 | Carbon costs rise at interval 7 per year | 0.0 |