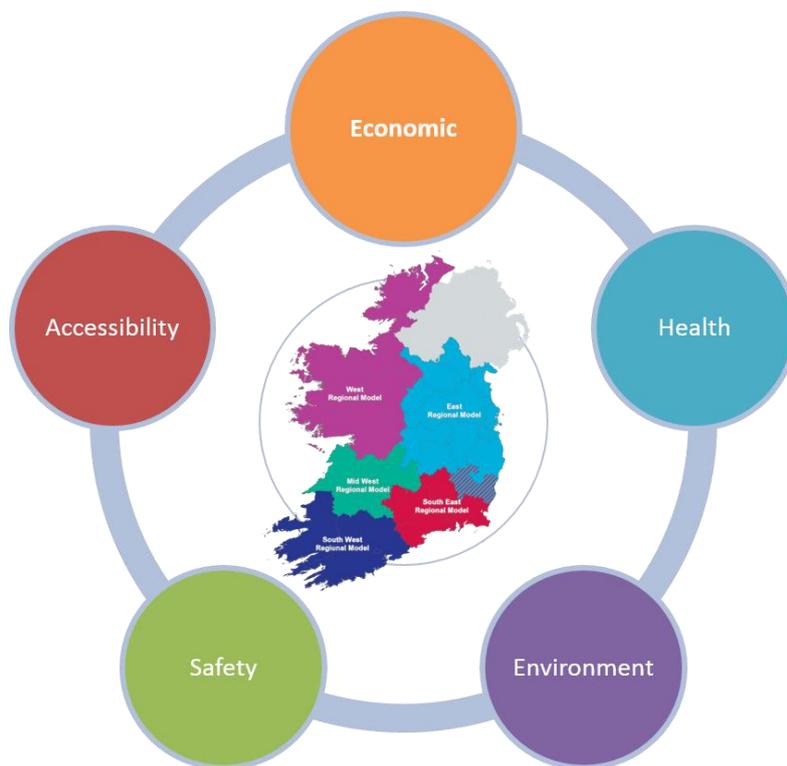




# NTA

**Údarás Náisiúnta Iompair**  
National Transport Authority



## Economic Module

### User Guide

March 2021 (v3.1.1)

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## Foreword

This document is designed to guide both new and experienced users through the main processes of the Economic Module as part of the NTA's Appraisal Toolkit. Note this tool and User Guide have been designed and developed for the V3 RMS models. It includes a troubleshooting section to help guide the user through any known issues that may arise through its use. For more detailed information on the module please see the Economic Module Development Report and Version Control Log.

It is assumed the user has prior CUBE and TUBA experience.

## 1 What is the tool being used for?

There are three general categories of use for the Economic Module, as shown below. The different steps to be taken for each is as follows:

- 1) **Economic Appraisal of Do Minimum against a single Do Something (Purpose 1) –**
  - Uses the full tool to test a single Do Something against a Do Minimum. This includes an **automated TUBA run**.
  - Sections to follow for instructions;
    - [Section 4](#) (Scheme File Creator)
    - [Section 5.1](#), [Section 5.2](#) (Cube Program)
  - For further analysis of outputs;
    - [Section 6.2](#) (Extracting Detailed Outputs)
    - [Section 7](#) (TUBA Analyser)
  
- 2) **Economic Appraisal of Do Minimum against many Do Somethings (Purpose 2) –**
  - Uses the tool to produce scheme files and skims for many Do Somethings to use against one Do Minimum. This does not include an automated TUBA run.
  - Sections to follow for instructions;
    - [Section 4](#) (Scheme File Creator)
    - [Section 5.3](#), [Section 5.4](#) (Cube Program),
    - [Section 6](#) (Running TUBA)
  - For further analysis of outputs;
    - [Section 7](#) (TUBA Analyser)
  
- 3) **TUBA Output Manipulations –**
  - Uses the TUBA Analyser to remove user specified sector-sector movements, focus on a single time period and set minimum benefits boundaries. Outputs a recalculated TEE (Transport Economic Efficiency) table with user specified rules applied.
  - Sections to follow for instructions;
    - [Section 6.2](#) (Extracting Detailed Outputs)
    - [Section 7](#) (TUBA Analyser)

The flowchart below in Figure 1.1 is provided to compliment the above list and help the user identify the tasks required for the appraisal process through a series of yes/no questions. The



flowchart in Figure 2.1 represents the key data inputs, procedures and outputs that comprise the Economic Module.

For **troubleshooting** please refer to [Section 7](#).

## 1.1 Contents

This document is structured by the different elements of the process, as shown in **Error! Reference source not found.** These are broken down as follows:

Section **Error! Reference source not found.** – Location of the Economy module and required programmes

Section **Error! Reference source not found.** – Scheme File Creator (Process 1)

Section **Error! Reference source not found.** – CUBE Process (Process 2)

Section 6 – TUBA (Process 3)

Section 7 – TUBA Analyser (Process 4)

Section 8 – Troubleshooting

Appendix A – Files and directories

Appendix B – Model machine matrix



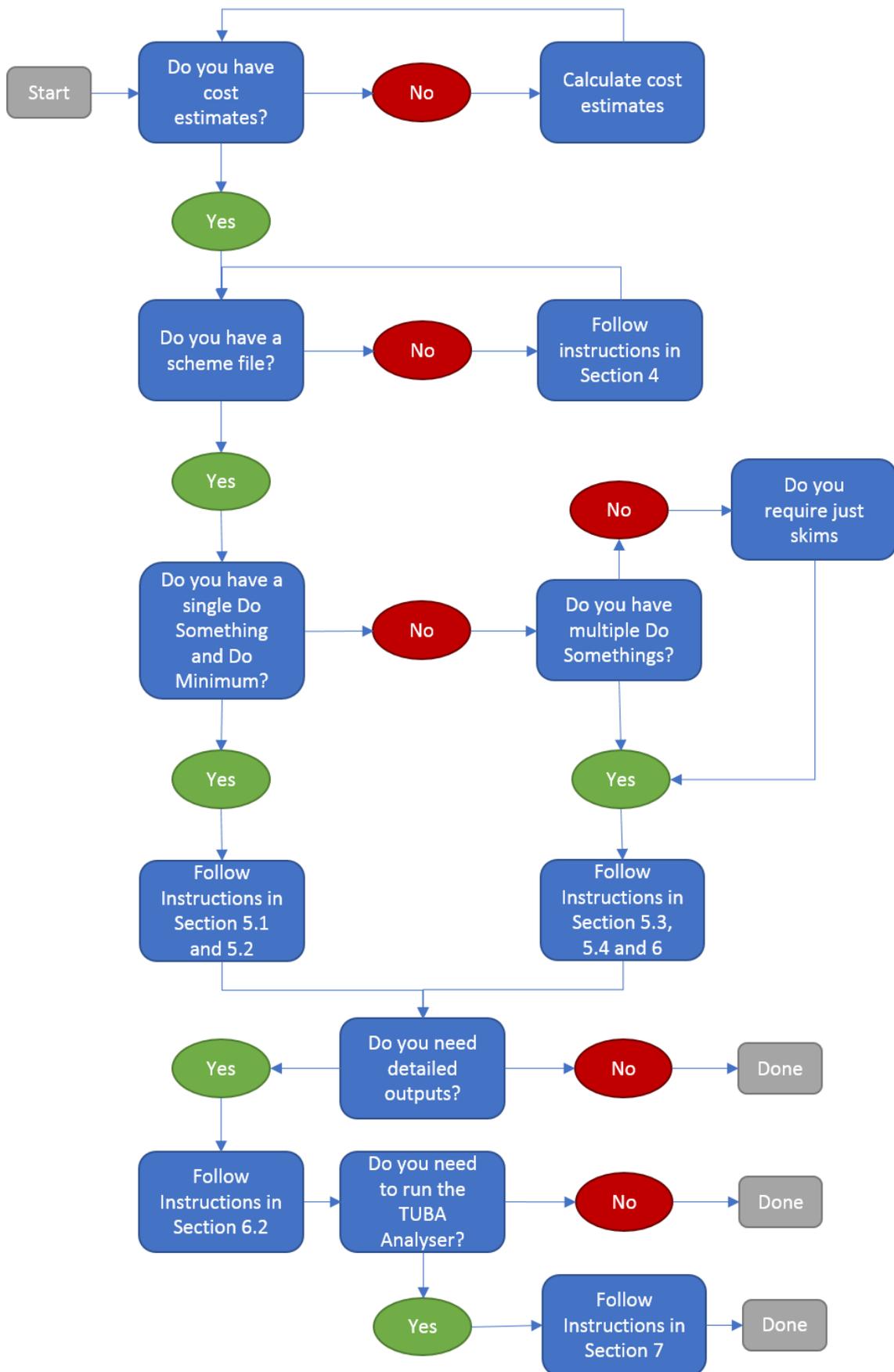


Figure 1.1 Flow chart guide to instructions



## 2 Overview of Process

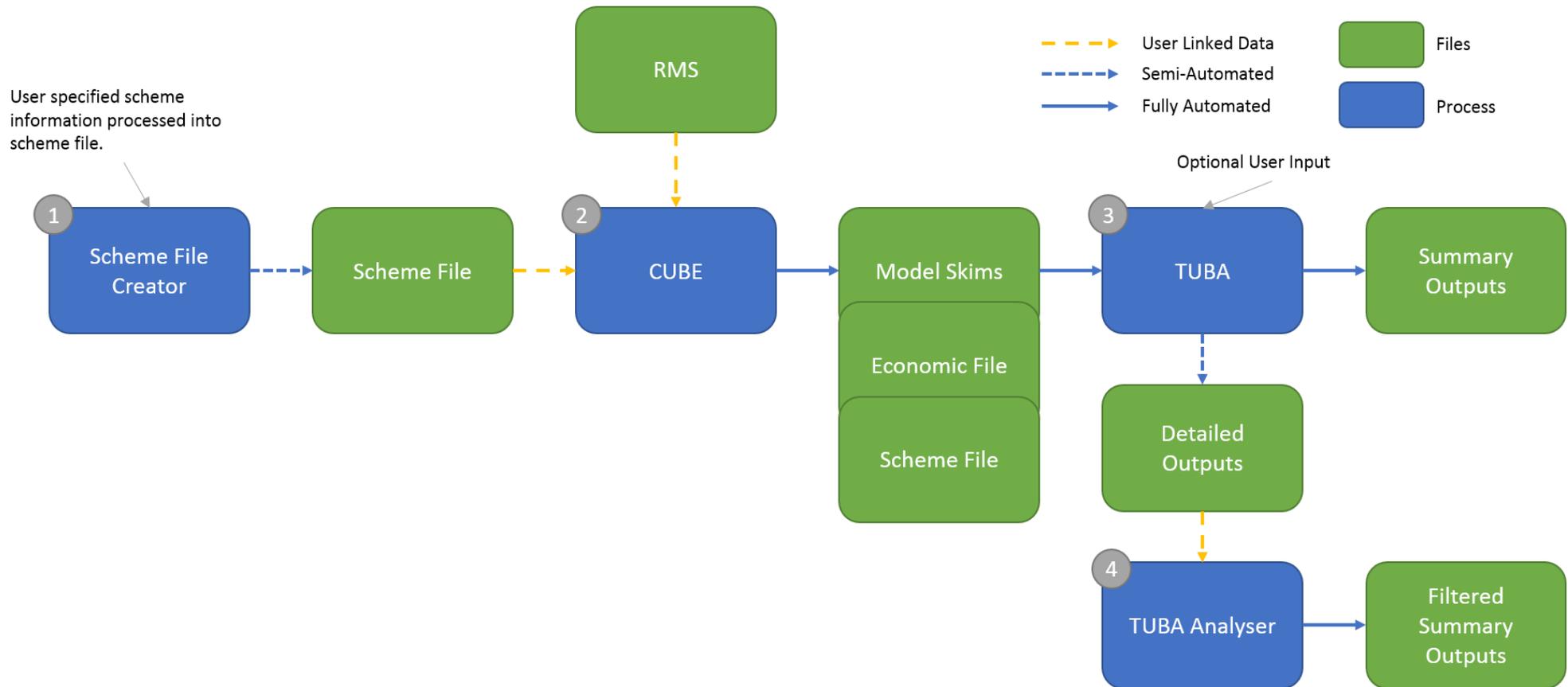


Figure 2.1 Overview of Economic Module Process



### 3 Before you Start

The latest version of the Economic Module is stored here;

**NDFM:\04\_Data\Appraisal Tools\Appraisal\_Modules\_Version\_3\Economic**

The 0\_Version\_Control subfolder contains the Version Control Log.

The 1\_Program subfolder contains the Module files for the latest version.

The 2\_Economic\_File subfolder contains the Economics Input File for TUBA, which defines the Economic Parameters used, and the corresponding Economics Input File version log.

To run Economic Module the following programs must be installed on the local machine;



**CUBE Voyager V6 or above**



**SATURN 10 or 11**



**Microsoft Excel**



**TUBA v1.9.14.3**

Also included is a program called (Region)\_Seq\_2\_Hier.exe and a file (Region)\_SEQ\_Hier\_Zones.Dat that should sit in the \Params\Zone\_Conversion folder of the cube program. A version of this program and equivalence file exists per regional model. This .exe file converts from the Saturn zone system to a hierarchal zoning system for TUBA.

The folder structure and required files to run this tool are shown at the bottom of this document in Appendix A.



## 4 Scheme File Creator (Process 1)

### 4.1 Process for Public Transport and Highway Scheme Files

To create a scheme file, follow the steps below;

- 1) Copy the latest scheme file creator to a working location.
- 2) Open the scheme file creator
- 3) If using the tool for Purpose 2 (many Do Somethings) go to step 8, otherwise if you are using the tool for Purpose 1 (1 Do Something vs 1 Do Minimum) continue to step 4

## PURPOSE 1

### 4.2 Purpose 1 – Set up scheme parameters

- 4) Complete the tab “TUBA Run”

NTA Appraisal Tools: Economic Appraisal  
**Scheme File Builder**

Generate TUBA Scheme File		Scheme File Details
TUBA inputs	Sector definition file (*.csv)	C:\WRM\SectorList_For_TUBA.csv
	Cube Defined Skim Path?	Yes
	Skim Matrices Path (*)	C:\WRM
Output file	Output file path (*)	C:\WRM
	Output scheme filename (*.txt)	Full_SchemeFile.txt

Set this to Yes, this will tell the scheme file creator that CUBE will define the skim paths

Run TUBA Batch File		TUBA Run Details
TUBA inputs	Scheme File Path (*)	C:\WRM\TUBA\Runs\Parameters
	Scheme File Title (.txt)	Full_SchemeFile
TUBA inputs	Economics file path (*)	C:\WRM\TUBA\Runs\Parameters
	Economics File Title (.txt)	NTA_Economics_Input_CAF_Final
Output file	Batch file path (*)	C:\WRM\TUBA\Runs\Parameters
	Batch filename (.bat)	Scenario2
Output file	Output Path (*)	C:\WRM\TUBA\Runs\Parameters
	Output File Title (.OUT)	Scenario2

Complete only this section

Detailed outputs analysis		TUBA detailed analysis (optional as part of Run TUBA process)
		<input checked="" type="checkbox"/> (Check this box to produce detailed outputs analysis)
TUBA path	Tuba Directory (*)	C:\Program Files\DFT\TUBA v1.9.4 64bit\
Analysis files	Analysis files path (*)	C:\WRM\TUBA\Runs\Parameters\AnalysisFiles
	Tuba Analyser Filename (.xism)	TubaAnalyser_CC_v3.xism

Run TUBA

Errors/ warnings: 1  
ERROR: The output file path C:\Test dd  
Excel macro process completed  
Excel macro process completed

Errors/ warnings: 0  
Excel macro process completed

Figure 4.1 TUBA Run tab – Purpose 1

- 5) Complete the tab “Scheme Inputs” - The Scheme Inputs tab contains the basic information required for the scheme file including model names, various year definitions and time slices. Ensure the relevant annualisation factors are inputted for the model/project. Also ensure Forecast year 3 is empty if running a one/two year TUBA.



NTA Appraisal Tools: Economic Appraisal  
**Scheme Input Worksheets: Main Parameters**

**PARAMETERS**

TUBA Version	1.9.4
TUBA run title	TUBA_RUN2
Do Min test ID	2035DM
Do Some test ID	2035S2
Scheme Opening Year	2025
Horizon Year	2095
Modelled Years	2039 2065 2050
Detailed outputs required or not	Yes
Current Year	2016
Maximum Warning messages	50
Car speed for P&R leg	65
Zone as sectors	Yes

**Time Slices**

*no.	duration(min)	annualisation	period	description
1	60	616	1	0700-1000
2	60	3044	2	1000-1300
3	60	688	3	1300-1600
4	60	688	4	1600-1900

**Do Minimum Schemes**

*Mode	Construction_yr	Opening_yr	Stage

**Do Minimum Costs**

*Type	Mode	Funding	Cost	Price

**Do Minimum Cost Profile**

*Year	Mode	%Const	%Land	%Prep

**Do Minimum Delay Costs**

*Year	Mode	Business	Commuting	Other	Freight

**Do Something Schemes**

*Mode	Construction_yr	Opening_yr	Stage
1	2015	2025	S1
2	2015	2025	

**Do Something Delay Costs**

*Year	Mode	Business	Commuting	Other	Freight

**Benefit Changes (% change per annum)**

*Start_yr	End_yr	Submode	ChangePer1	ChangePer2	ChangePer3	ChangePer4	ChangePer5

**Sector File References**

*mode	Sector_file_name
1	C:\WRM
2	C:\WRM

**Annotations:**

- Forecast Year 3**: Points to 2065 in Modelled Years.
- Forecast Year 2 +30**: Points to 2095 in Horizon Year.
- Forecast Year 1**: Points to 2025 in Scheme Opening Year.
- Forecast Year 2**: Points to 2050 in Modelled Years.
- Scheme identification variables. These do not affect the run.**: Points to TUBA Version, TUBA run title, Do Min test ID, Do Some test ID.
- Always set this to "Yes", if "No" only .OUT summary will be available**: Points to Detailed outputs required or not.
- Year the costs are being prepared (not the model base year)**: Points to Current Year.
- If set to "Yes" sectors will not be used. Instead results will be output by Zone - VERY LARGE FILE**: Points to Zone as sectors.
- Very important to use correct annualisation factors**: Points to annualisation column in Time Slices table.
- Nalini Murkuttia: 1 Road 2 PT**: Points to Stage column in Do Something Schemes table.

Figure 4.2 Scheme Inputs Tab



- 6) Complete the tab “**Matrix Inputs**” (If undertaking a 3 year run, go to Matrix Inputs\_3Yrs) - The Matrix Inputs tab allows the user to define the location of the skim files created during the Cube TUBA output process. This section also allows factoring of demand to simulate a future year. Only factors highlighted red should be changed.

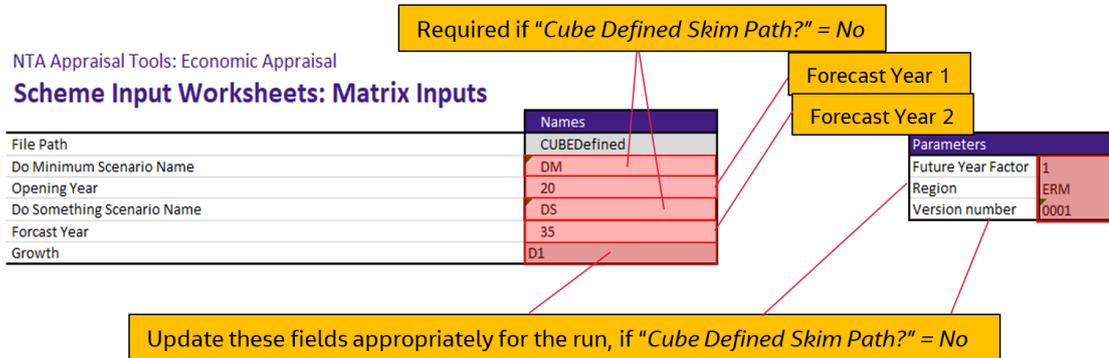


Figure 4.3 Matrix Inputs Tab – Purpose 1

- 7) Go to Step 11



**PURPOSE 2**

**4.3 Purpose 2 – Set up scheme parameters**

**8) Complete the tab “TUBA Run”**

NTA Appraisal Tools: Economic Appraisal  
**Scheme File Builder**

Generate TUBA Scheme File		Scheme File Details
TUBA inputs	Sector definition file (*.csv)	C:\WRM\SectorList_For_TUBA.csv
	Cube Defined Skim Path?	No
	Skim Matrices Path (*)	C:\WRM
Output file	Output file path (*)	C:\WRM
	Output scheme filename (*.txt)	Full_SchemeFile.txt

Run TUBA Batch File		TUBA Run Details
TUBA inputs	Scheme File Path (*)	C:\WRM\TUBA\Runs\Parameters
	Scheme File Title (.txt)	Full_SchemeFile
TUBA inputs	Economics file path (*)	C:\WRM\TUBA\Runs\Parameters
	Economics File Title (.txt)	NTA_Economics_Input_CAF_Final
Output file	Batch file path (*)	C:\WRM\TUBA\Runs\Parameters
	Batch filename (.bat)	Scenario2
Output file	Output Path (*)	C:\WRM\TUBA\Runs\Parameters
	Output File Title (.OUT)	Scenario2

Detailed outputs analysis		TUBA detailed analysis (optional as part of Run TUBA process)
		<input checked="" type="checkbox"/> (Check this box to produce detailed outputs analysis)
TUBA path	Tuba Directory (*)	C:\Program Files\DFT\TUBA v1.9.4 64bit\
Analysis files	Analysis files path (*)	C:\WRM\TUBA\Runs\Parameters\AnalysisFiles
	Tuba Analyser Filename (.xism)	TubaAnalyser_CC_v3.xism

Errors/ warnings: 0  
Excel macro process completed

Run TUBA

Set this to No, this will then allow you to point the scheme file to the required skims

Define the skims path here

Only this part of the tab needs to be completed

**Figure 4.4 TUBA Run tab – Purpose 2**



9) Complete the tab “Scheme Inputs” - The Scheme Inputs tab contains the basic information required for the scheme file including model names, various year definitions and time slices.

NTA Appraisal Tools: Economic Appraisal  
**Scheme Input Worksheets: Main Parameters**

**PARAMETERS**

TUBA Version	1.9.4
TUBA run title	TUBA_RUN2
Do Min test ID	2035DM
Do Some test ID	2035S2
Scheme Opening Year	2025
Horizon Year	2095
Modelled Years	2039 2065 2050
Detailed outputs required or not	Yes
Current Year	2016
Maximum Warning messages	50
Car speed for P&R leg	65
Zone as sectors	Yes

**Time Slices**

*no.	duration(min)	annualisation	period	description
1	60	616	1	0700-1000
2	60	3044	2	1000-1300
3	60	688	3	1300-1600
4	60	688	4	1600-1900

**Do Minimum Schemes**

*Mode	Construction	Opening_yr	Stage

**Do Minimum Costs**

*Type	Mode	Funding	Cost	Price

**Do Minimum Cost Profile**

*Year	Mode	%Const	%Land	%Prep

**Do Minimum Delay Costs**

*Year	Mode	Business	Commuting	Other	Freight

**Do Something Schemes**

*Mode	Construction	Opening_yr	Stage
1	2015	2025	S1
2	2015	2025	

**Do Something Delay Costs**

*Year	Mode	Business	Commuting	Other	Freight

**Benefit Changes (% change per annum)**

*Start_yr	End_yr	Submode	ChangePer1	ChangePer2	ChangePer3	ChangePer4	ChangePer5

**Sector File References**

*mode	Sector_file_name
1	C:\WRM
2	C:\WRM

**Annotations:**

- Forecast Year 3**: Points to the 2039 modelled year.
- Scheme identification variables. These do not affect the run.**: Points to the TUBA run title and test IDs.
- Forecast Year 2 +30**: Points to the 2065 modelled year.
- Forecast Year 1**: Points to the 2050 modelled year.
- Forecast Year 2**: Points to the 2050 modelled year.
- Always set this to “Yes”, if “No” only .OUT summary will be available**: Points to the 'Detailed outputs required or not' parameter.
- Year the costs are being prepared (not the model base year)**: Points to the 'Current Year' parameter.
- If set to “Yes” sectors will not be used. Instead results will be output by Zone – VERY LARGE FILE**: Points to the 'Zone as sectors' parameter.
- Very important to use correct annualisation factors**: Points to the 'annualisation' column in the Time Slices table.
- Nalini Murkutila: 1 Road 2 PT**: Points to the 'Stage' column in the 'Do Something Schemes' table.

Figure 4.5 Scheme Inputs Tab



10) Complete the tab “**Matrix Inputs**” - The Matrix Inputs tab allows the user to define the location of the skim files created during the Cube TUBA output process. This section also allows factoring of demand to simulate a future year.

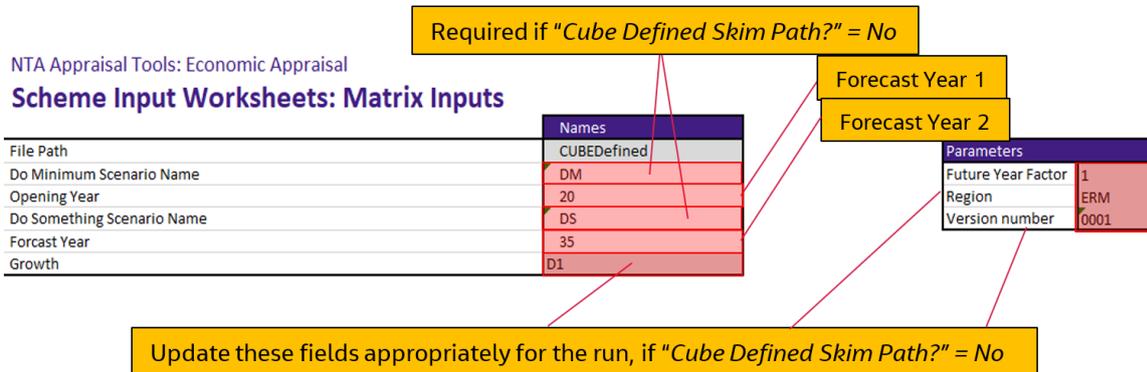


Figure 4.6 Matrix Inputs Tab

#### 4.4 Scheme File Costs (All Purposes)

11) Complete the tab “Cost Main Parameters” - The Cost Main Parameters tab includes information on the level of cost detail, time span of assessment, risk allowance and inflation.

NTA Appraisal Tools: Economic Appraisal

### Cost Input Worksheets: Main Parameters

		Details	
Scheme Name		Galway ITMP S2	
Cost Estimate Stage		Outline Cost Estimate	
Current Year		2016	
Appraisal Price Base Year		2009	
Scheme Opening Year		2025	
Scheme Type		Public Transport	
Appraisal Period (Years)		30	
Residual Value Period (Years)		30	

Appraisal Price Base Year is the year that your value of time and vehicle operating costs are from.

Select what type of Scheme you are testing (Highway or Public Transport)

Annual Inflation		Inflation Rate	Inflation Factor
Construction		2.0%	1.00
Land		3.0%	1.00
Operating & Maintenance		1.0%	1.00

Risk	
Risk Allowance	20.0%

Version Control  
v0

These are the default values for most runs. Unless otherwise provided with figures it is best to keep these.

Figure 4.7 Cost Main Parameters Tab



12) Complete the tab “Capital Cost Inputs” - The Capital Costs Input tab is where the costs of the project are defined and automatically adjusted to base year prices (to match economics file). The cost spread for capital cost can be entered in value per year OR as a percentage of total cost per year (from which the cost per year will be automatically entered).

NTA Appraisal Tools: Economic Appraisal					
Cost Input Worksheets: Capital Costs					
Scheme Costs (2016, market prices)		€m			
Outline Cost Estimate	€	157.10			
Consumer Price Index		CPI			
CPI Index for month of cost estimate		106.3			Values available from CSO
CPI Index for base year		103.8			
Shadow Prices		€m			
Shadow Price of Public Funds		130%			Leave as is unless provided with different values
Shadow Price of Labour		80%			
Relative Price Factor		100%			
Cost Breakdown					
Expenditure Type	€m	Public Funds %	Labour Content %	Portion of Total %	VAT %
Main Contract Construction	57.69	100%	30%	37%	13.5%
Main Contract Supervision	4.54	100%	50%	3%	23.0%
Archaeology (all phases)	1.82	100%	50%	1%	18.3%
Advance works	9.08	100%	30%	6%	13.5%
Residual Network	4.54	100%	30%	3%	13.5%
Land & Property	20.88	100%	10%	13%	0.0%
Planning and Design	12.43	100%	60%	8%	23.0%
Inflation Allowance	23.94				
Risk Allowance	22.19				
Inflated Base Cost	157.10				

Figure 4.8 Capital Cost Inputs tab (1 of 2)

Cost Profile (2016, market prices)		% Costs						
Complete either "Actual Costs" or "% of Costs"		Main Contract Construction	Main Contract Supervision	Archaeology (all phases)	Advance works	Residual Network	Land & Property	Planning and Design
Year	Value €m							
2006								
2007								
2008								
2009								
2010								
2011								
2012								
2013								
2014								
2015								
2016								
2017								60%
2018							100%	40%
2019				20%	50%			
2020		10%	20%	20%	50%			
2021		25%	20%	20%				
2022		25%	20%	20%				
2023		25%	20%	20%				
2024		10%	10%			50%		
2025		5%	10%			50%		
Total		100%	100%	100%	100%	100%	100%	100%

Figure 4.9 Capital Cost Inputs tab (2 of 2)

13) If creating a scheme file for a Public Transport Scheme continue with step 14, if creating a scheme file for a Highway Scheme go to step 18.



**PUBLIC TRANSPORT SCHEME FILE**

**4.5 Public Transport Relevant Costs**

**14)** Complete the “**Annual O&M Costs Inputs**” tab if required - The Annual O&M Cost Input allows Operation and Maintenance annual costs to be entered. If the maintenance costs required are not yearly then the costs should be entered in the Segmented Maintenance tab. Maintenance costs for new roads should be entered into the Annual Road Maintenance tab.

**Figure 4.10 Annual O&M Costs Inputs tab (Public Transport)**

NTA Appraisal Tools: Economic Appraisal

**Cost Input Worksheets: Annual O&M Costs (Public Transport)**

	€m	Labour Content %	Public Funds %	Apply	Apply
<b>Operations</b>					
Staff	10.94	100%	100%	8.752	11.3776
Traction				0	0
Insurance				0	0
Other				0	0
<b>Leave Following Blank if No Annual Maintainance</b>					
<b>Vehicles</b>					
Routine Maintenance		60%	100%	0	0
Additional Works				0	0
Depot				0	0
<b>Infrastructure</b>					
Landscaping				0	0
Road Maintenance				0	0
Track Maintenance				0	0
Tunnel Maintenance				0	0
<b>Other Infrastructure</b>					
Routine Maintenance	0.00	60%	100%	0	0
Additional Maintenance				0	0
<b>Complete these sections as needed</b>					
<b>Subtotal</b>			€m		
			<b>10.94</b>		
<b>Contingency</b>			%		
			<b>0%</b>		
				€m	
<b>Total Annual O&amp;M Costs (€m, factor costs, 2016 prices, incl. contingency &amp; shadow prices)</b>					<b>11.38</b>
				€m	
<b>Total Annual O&amp;M Costs (€m, factor costs, 2009 prices, incl. shadow prices)</b>					<b>11.11</b>

**15)** Complete the “**Segmented Maintenance**” tab if required - The Segmented Maintenance tab allows inclusion of maintenance costs that only occur every x number of years, as is common for Public Transport.



### Cost Input Worksheets: Segmented Maintenance Costs

Public Transport		Highway	
Opening Year	2025	2025	2025
Maintenance Cost (€mil)	€ 1.60	Maintenance Cost (€mil)	€ -
Applied every	10	Applied every	0
Maintenance Cost 2009 Prices (€mil)	€ 1.56	Maintenance Cost 2009 Prices (€mil)	€ -

Annotations:

- Enter cost in "Current Year" prices here (points to Maintenance Cost (€mil) in Public Transport)
- Number of years between each repeat cost (points to Applied every in Public Transport)

Figure 4.11 Segmented Maintenance tab (Public Transport)

- 16) Complete the "Vehicle Fleet Requirements" tab if required - The Vehicle Fleet Requirements allows costs for fleet purchase and fleet renewal costs to be included in the costs. This should only be filled in if costs are not previously included in capital costs and segmented maintenance.

NTA Appraisal Tools: Economic Appraisal

### Cost Input Worksheets: Vehicle Fleet Requirements & Renewals

	€m	Labour Content %	Public Funds %	Apply SPL	Apply SPPF
Fleet Capital Costs (€m, factor costs, 2016 prices)	0.00	0%	100%	0	0
Factored to include shadow pricing					
	€m				
	0.00				
Year of Purchase					
	Year				
	2035				
Fleet Renewal Frequency					
	Frequency (years)				
	30				
Fleet Capital Costs (€m, factor costs, 2009 prices, incl. shadow prices)					
	€m				
	0.00				

Annotation: If Fleet Capital costs included in "Segmented Maintenance" do not include it here (points to the 0.00 value in the Fleet Capital Costs row)

Figure 4.12 Vehicle Fleet Requirements tab (Public Transport)

- 17) Go to step 20



**HIGHWAY SCHEME FILE**

**4.6 Highway Relevant Costs**

18) Complete the “Annual Road Maintenance” tab - The Annual Road Maintenance tab allows the user to calculate and include annual maintenance costs for schemes with new roads.

NTA Appraisal Tools: Economic Appraisal

**Cost Input Worksheets: Annual Maintenance Costs (Road)**

Road Type	NRA PAG Maintenance Costs (€1,000/km/year)	Length (km)	Annual Cost (€m)
Standard 2 lane with H/S	18.327	0	€ -
2+1 with central reserve	30.023	0	€ -
2+1 without central reserve	18.327	0	€ -
Dual Carriageway / Motorway	41.718	0	€ -
<b>Other Maintenance Costs</b>			<b>Annual Cost (€m)</b>
Bored Tunnel	Complete this if values not provided		0.00
C&C Tunnel	Manually enter values, if provided, here		0.00
<b>Total Annual Maintenance Costs (€m, factor costs, 2016 prices)</b>			<b>€m</b> 0.00
<b>Shadow Pricing</b>			<b>%</b>
Labour Content %			30%
Public Funds %			100%
			<b>€m</b>
<b>Total Annual Maintenance Costs (€m, factor costs, 2016 prices, incl. shadow prices)</b>			<b>€m</b> 0.00
			<b>€m</b>
<b>Total Annual Maintenance Costs (€m, factor costs, 2009 prices)</b>			<b>€m</b> 0.00

Figure 4.13 Annual Maintenance Tab (Highway)

19) Complete the “Segmented Maintenance” tab if required - The Segmented Maintenance tab allows inclusion of maintenance costs that only occur every x number of years, this could be due to bridge or tunnel overhauls.

**Cost Input Worksheets: Segmented Maintenance Costs**

Public Transport		Highway	
Opening Year	2025	Opening Year	2025
Maintenance Cost (€mil)	Enter cost in “Current Year” prices here	Maintenance Cost (€mil)	€ -
Applied every	10	Applied every	0
Maintenance Cost 2009 Prices (€mil)	Number of years between each repeat cost	Maintenance Cost 2009 Prices (€mil)	€ -
	€ 1.56		

Figure 4.14 Segmented Maintenance tab (Public Transport)



## 4.7 Export Scheme File (All Purposes)

### 20) Export the scheme file via the tab “Scheme Inputs”

NTA Appraisal Tools: Economic Appraisal  
**Scheme File Builder**

Generate TUBA Scheme File		Scheme File Details
TUBA inputs	Sector definition file (*.csv)	C:\WRM\SectorList_For_TUBA.csv
	Cube Defined Skim Path?	Yes
	Skim Matrices Path (*)	C:\WRM
Output file	Output file path (*)	C:\WRM
	Output scheme filename (*.txt)	Full_SchemeFile

Click this button once tabs complete to create scheme file

Create Full Scheme File

Errors/ warnings: 1  
ERROR: The output file path C:\Test d...  
Excel macro process completed  
Excel macro process completed

Figure 4.15 Export Scheme File

The above steps exports the scheme file as a text document. The costs and costs profile are not exported by this step. The following step, step 21, needs to be undertaken to obtain these.

### 21) Copy the contents of Column A of sheet “NTA Standard Cost Spreadsheet” and paste into the newly created scheme file replacing DO\_SOM\_COSTS and DO\_SOME\_PROFILE

Copy column A

DO_SOM_COSTS					
*Type	Mode	Funding	Cost	Price	GDP
C	2	cen	64084.3	F	103.8
L	2	cen	29477.1	F	103.8
P	2	cen	23334.6	F	103.8
S	2	cen	3445.9	F	103.8
O	2	cen	1520912.8	F	103.8
M	2	cen	12223.2	F	103.8

DO_SOM_PROFILE									
*Year	Mode	%Conat	%Land	%Prep	%Super	%Maint	%Op	%Grant	%Dev
2017	2	0.0	0.0	17.9	0.0	0.0	0.0	0.0	0.0
2018	2	0.0	100.0	12.5	0.0	0.0	0.0	0.0	0.0
2019	2	0.0	0.0	21.6	0.0	0.0	0.0	0.0	0.0
2020	2	9.6	0.0	22.0	19.3	0.0	0.0	0.0	0.0
2021	2	24.5	0.0	1.2	19.6	0.0	0.0	0.0	0.0
2022	2	24.9	0.0	1.2	20.0	0.0	0.0	0.0	0.0
2023	2	25.5	0.0	1.2	20.3	0.0	0.0	0.0	0.0
2024	2	10.3	0.0	11.1	10.3	0.0	0.0	0.0	0.0
2025	2	5.2	0.0	11.3	10.5	0.0	0.9	0.0	0.0
2026	2	0.0	0.0	0.0	0.0	0.0	0.9	0.0	0.0
2027	2	0.0	0.0	0.0	0.0	0.0	0.9	0.0	0.0
2028	2	0.0	0.0	0.0	0.0	0.0	0.9	0.0	0.0
2029	2	0.0	0.0	0.0	0.0	0.0	0.9	0.0	0.0
2030	2	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0
2031	2	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0
2032	2	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0
2033	2	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0
2034	2	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0
2035	2	0.0	0.0	0.0	0.0	0.0	1.1	0.0	0.0
2036	2	0.0	0.0	0.0	0.0	0.0	1.1	0.0	0.0
2037	2	0.0	0.0	0.0	0.0	0.0	1.1	0.0	0.0
2038	2	0.0	0.0	0.0	0.0	0.0	1.1	0.0	0.0
2039	2	0.0	0.0	0.0	0.0	0.0	1.2	0.0	0.0
2040	2	0.0	0.0	0.0	0.0	16.2	1.2	0.0	0.0
2041	2	0.0	0.0	0.0	0.0	0.0	1.2	0.0	0.0

Paste in full costs and costs profile to the newly created scheme file

Figure 4.16 Copy out costs profile

### 22) Continue to checking



## 4.8 Checking

The following are checks that must be undertaken before moving onto the next section;

- Is “detail” set to Yes in the parameters of the scheme file? (Figure 4.17)
- If no sector system is being used, or the TUBA run is for the Accessibility and Social Inclusion Tool, is “zones\_as\_sectors” equal to Yes? (Figure 4.17)
- If a sector system is being used (required if using TUBA analyser) is “zones\_as\_sectors” equal No? (Figure 4.17)

PARAMETERS		
TUBA_version	1.9.4	
run_name	TUBA_RUN1	
do_min_name	ACJ	
do_som_name	ACL	
first_yr	2027	
horizon_yr	2087	
modelled_yrs	2027	2057
detail	Yes	
current_yr	2017	
print_warn	50	
P&R_car_speed	65	
zones_as_sectors	Yes	

Figure 4.17 Parameter table of typical scheme file

- Does the scheme cost profile add up to 100% for each column? (Figure 4.18)

Sum these columns to ensure they add up to 100%. If they do not correct the final year as required.

DO_SOM_PROFILE		%Const	%Land	%Prep	%Super	%Maint	%Op	%Grant	%Dev
*Year	Mode								
2018	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2019	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2020	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2021	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2022	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2023	2	9.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2024	2	9.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2025	2	9.8	24.1	0.0	0.0	0.0	0.0	0.0	0.0
2026	2	19.9	24.7	0.0	0.0	0.0	0.0	0.0	0.0
2027	2	20.2	25.3	0.0	0.0	0.0	1.2	0.0	0.0
2028	2	20.6	25.9	0.0	0.0	0.0	1.2	0.0	0.0
2029	2	10.4	0.0	0.0	0.0	0.0	1.2	0.0	0.0
2030	2	0.0	0.0	0.0	0.0	0.0	1.3	0.0	0.0
2031	2	0.0	0.0	0.0	0.0	0.0	1.3	0.0	0.0
2032	2	0.0	0.0	0.0	0.0	0.0	1.3	0.0	0.0
2033	2	0.0	0.0	0.0	0.0	0.0	1.3	0.0	0.0
2034	2	0.0	0.0	0.0	0.0	0.0	1.3	0.0	0.0
2035	2	0.0	0.0	0.0	0.0	0.0	1.3	0.0	0.0
2036	2	0.0	0.0	0.0	0.0	0.0	1.3	0.0	0.0
2037	2	0.0	0.0	0.0	0.0	0.0	1.4	0.0	0.0
2038	2	0.0	0.0	0.0	0.0	0.0	1.4	0.0	0.0
2039	2	0.0	0.0	0.0	0.0	0.0	1.4	0.0	0.0

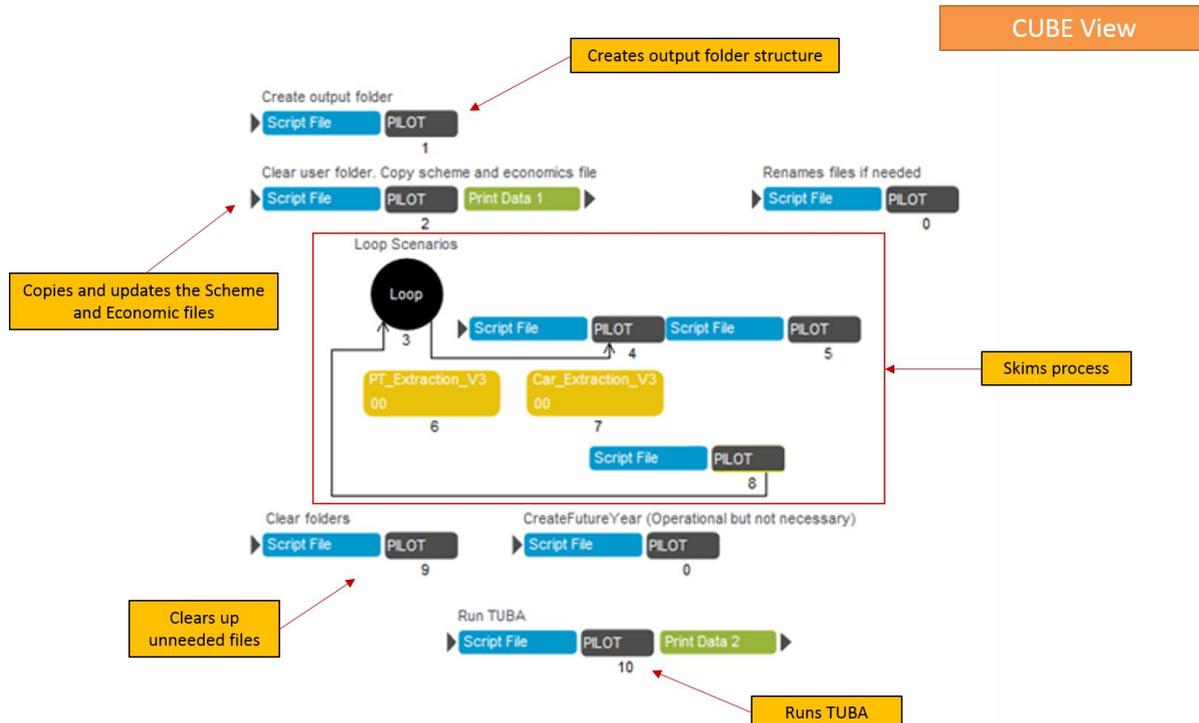
Figure 4.18 Do Something Profile in Scheme File

- Are the correct base reference matrices in {Catalog dir}\Program\Base\_Ref\_Mats?



## 5 CUBE Process (Process 2)

Figure 5.1 shows the main Cube view seen by the user when opening Cube with annotation describing the main sections.



**Figure 5.1** Cube process as seen by the user

The CUBE process removes very small ( $<10^{-10}$ ) values and negative values from the demand matrices, as these interfere with the TUBA process. These values get combined and presented in text files, in the following directory: {Catalog dir}\Program\Analysis\SmallNumAndNegNumLogs. These files get produced per run by the following naming convention: {Regional Model}\_{Year}\_{Run ID}\_ SmallNumAndNegNumLog\_(User Type).

### PURPOSE 1

#### 5.1 Process (Full Run – Purpose 1)

This step assumes you have a checked Scheme file ready to use.

This process tree covers a full run of the Cube Process and assumes that you have a checked scheme file and intend to run TUBA.

- 1) Copy the latest version of the Economic Module from the network to the local C Drive (see [Section 3](#) for link)
- 2) Create the folder structure as described in Appendix A, and ensure files are copied to the correct location.



- 3) Open Cube and allow it to update all file paths. (Figure 5.2)

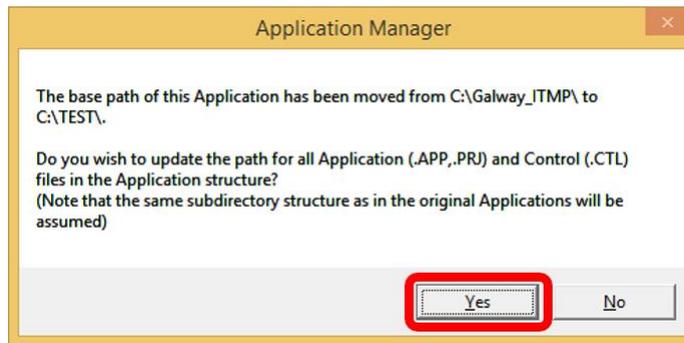


Figure 5.2 Cube prompt to update links

- 4) Create a new “child” under the correct regional model. This will create a new scenario with the regional model defaults included.
- 5) Open the new scenario key entry and complete the keys as shown below. Alternatively see Figure 5.4 to 5.7 for a view of the key entries.

Key	Value to be Entered (Purpose 1)
<b>Keys Page 1 (Figure 5.4)</b>	
Region	ERM, WRM, SWRM, SERM, MWRM
Zones	1953 (ERM), 836 (WRM), 834 (SWRM), 654 (SERM), 650 (MWRM)
Temp SATURN Folder	C:\ST
SATWIN Directory	C:\SATWIN\XEXES (Check local machine)
Skims Only?	False
Scheme File Path	File path of Scheme File including scheme file name.
Economic File Path	File path of Economic File inclusion file name.
Tuba Installation	'C:\Program Files\DfT\TUBA v1.9.14 64bit\tuba_g.exe' (Check local machine)
RunTuba	True
<b>Keys Page 2 (Figure 5.5)</b>	
Do Minimum Forecast Year 1	True
Run from remote location	True if model run on the network, false if running from model run catalog directory
Run Folder Directory	Model Run Catalog Directory\Runs
Do Something Forecast Year 1	True



Run from remote location	True if model run on the network, false if running from model run catalog directory
Run Folder Directory	Model Run Catalog Directory\Runs
Forecast Year 1	First forecast year in YY format
DM Run ID	Do Minimum Run ID
DS Run ID	Do Something Run ID
Growth	Demand for first forecast year
<b>Keys Page 3 (Figure 5.6)</b>	
Do Minimum Forecast Year 2	True
Run from remote location	True if model run on the network, false if running from model run catalog directory
Run Folder Directory	Model Run Catalog Directory\Runs
Do Something Forecast Year 2	True
Run from remote location	True if model run on the network, false if running from model run catalog directory
Run Folder Directory	Model Run Catalog Directory\Runs
Forecast Year 2	Second forecast year in YY format
DM Run ID	Do Minimum Run ID
DS Run ID	Do Something Run ID
Growth	Demand for second forecast year
<b>Keys Page 4 (Figure 5.7)</b>	
Do Minimum Forecast Year 3	True
Run from remote location	True if model run on the network, false if running from model run catalog directory
Run Folder Directory	Model Run Catalog Directory\Runs
Do Something Forecast Year 3	True
Run from remote location	True if model run on the network, false if running from model run catalog directory
Run Folder Directory	Model Run Catalog Directory\Runs
Forecast Year 3	Third forecast year in YY format
DM Run ID	Do Minimum Run ID
DS Run ID	Do Something Run ID
Growth	Demand for third forecast year



## 5.2 Checking (Purpose 1)

The following are checks that must be undertaken before moving onto the next section;

- Are you using the latest version of the tool taken from the network?
- Does the zone number entered in the key match the number of zones in the model?
- Have you unticked *Skims Only*?
- Have you ticked the boxes for each scenario you wish to run?
- Have you ticked *RunTuba*?

Once these checks are complete press “Run” on the keys page. Output summary files from TUBA will be found in the Do Something run folder. For detailed outputs got to [Section 5.2](#).

### PURPOSE 2

## 5.3 Process (Partial Run – Purpose 2)

This step assumes you have scheme files for each run you intend to do checked and with correct file paths.

This process covers how to use the module to produce up to six sets of skims at a time for up to two different demand sets and years.

- 1) Copy down the latest version of the Economic Module from the network to the local C Drive.
- 2) Create the folder structure as described in Appendix A, and ensure files are copied to the correct location.
- 3) Open Cube and allow it to update all file paths. (Figure 5.3)

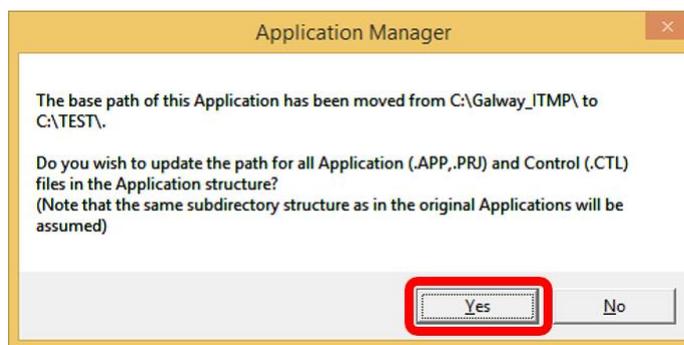


Figure 5.3 Cube prompt to update links

- 4) Create a new “child” under the correct regional model. This will create a new scenario with the regional model defaults included.
- 5) Open the new scenario key entry and complete the keys as shown below. Alternatively see Figure 5.8 to 5.11 for a view of the key entries.

Key	Value to be Entered (Purpose 2)
<b>Keys Page 1 (Figure 5.8)</b>	
Region	ERM, WRM, SWRM, SERM, MWORM
Zones	1953 (ERM), 836 (WRM), 834 (SWRM), 654 (SERM), 650 (MWORM)



Temp SATURN Folder	C:\ST
SATWIN Directory	C:\SATWIN\XEXES (Check local machine)
Skims Only?	True
Scheme File Path	A – Placeholder value as key not used
Economic File Path	A – Placeholder value as key not used
Tuba Installation	'C:\Program Files\Dft\TUBA v1.9.14 64bit\tuba_g.exe' (Check local machine)
RunTuba	False
<b>Keys Page 2 (Figure 5.9)</b>	
Do Minimum Forecast Year 1	True – Will include this model run, can be run without
Run from remote location	True – CUBE will take the next key as the run path False – CUBE will use the current Catalog Directory
Run Folder Directory	Model Run Catalog Directory\Runs
Do Something Forecast Year 1	True – Will include this model run, can be run without
Run from remote location	True – CUBE will take the next key as the run path False – CUBE will use the current Catalog Directory
Run Folder Directory	Model Run Catalog Directory\Runs
Forecast Year 1	Year of input runs in YY format
DM Run ID	First run with same demand as defined by Growth key and year defined by <i>Forecast Year 1</i> key.
DS Run ID	Second run with same demand as defined by Growth key and year defined by <i>Forecast Year 1</i> key.
Growth	Demand for input runs
<b>Keys Page 3 (Figure 5.10)</b>	
Do Minimum Forecast Year 2	True – Will include this model run, can be run without
Run from remote location	True – CUBE will take the next key as the run path False – CUBE will use the current Catalog Directory



Run Folder Directory	Model Run Catalog Directory\Runs
Do Something Forecast Year 2	True – Will include this model run, can be run without
Run from remote location	True – CUBE will take the next key as the run path False – CUBE will use the current Catalog Directory
Run Folder Directory	Model Run Catalog Directory\Runs
Forecast Year 2	Year of input runs in YY format
DM Run ID	First run with same demand as defined by Growth key and year defined by <i>Forecast Year 2</i> key.
DS Run ID	Second run with same demand as defined by Growth key and year defined by <i>Forecast Year 2</i> key.
Growth	Demand for input runs
<b>Keys Page 3 (Figure 5.11)</b>	
Do Minimum Forecast Year 3	True – Will include this model run, can be run without
Run from remote location	True – CUBE will take the next key as the run path False – CUBE will use the current Catalog Directory
Run Folder Directory	Model Run Catalog Directory\Runs
Do Something Forecast Year 3	True – Will include this model run, can be run without
Run from remote location	True – CUBE will take the next key as the run path False – CUBE will use the current Catalog Directory
Run Folder Directory	Model Run Catalog Directory\Runs
Forecast Year 3	Year of input runs in YY format
DM Run ID	First run with same demand as defined by Growth key and year defined by <i>Forecast Year 3</i> key.
DS Run ID	Second run with same demand as defined by Growth key and year defined by <i>Forecast Year 3</i> key.
Growth	Demand for input runs



## 5.4 Checking (Purpose 2)

The following are checks that must be undertaken before moving onto the next section;

- Are you using the latest version of the tool taken from the network?
- Does the zone number entered in the key match the number of zones in the model?
- Have you ticked *Skims Only*?
- Have you ticked the boxes for each scenario you wish to run?
- Have you unticked *RunTuba*?

Once these checks are complete press “Run” on the keys page. Output skims can be found in the run folders under the specified years and are ready for use in TUBA, see [section 6](#).



## Economic Appraisal Tool

RMS Appraisal Tools Suite

### Keys Setup

Page 1 of 4

Region: ERM

InputVersion: |

Zones: 1953

Temp SATURN Folder (Normally C:\\$T): C:\\$T

SATWIN Directory: C:\\$SATWIN\XEXES

Skims Only?

Scheme File Path: C:\NTA\AppraisalTools\Economic\Full\_SchemeFile.txt

Economic File Path: C:\NTA\AppraisalTools\Economic\NTA\_Economics\_Input\_CAF\_Final\_Dec2016.txt

Tuba Installation:  RunTuba

Tuba Installation Path: C:\Program Files\Dft\TUBA v1.9.4 64bit\tuba\_g.exe

Must match exactly the number of zones in the model or module will crash.

If true CUBE will only run the Skims process.

If set to True TUBA will launch on completion of the skims process and run with defined parameters.

CUBE will create a new copy of these files in the outputs folder. Default values are placeholders and do not link to real files.

Save
Close
Next...
Back...
Run

Figure 5.4 CUBE keys page 1



**Keys Setup**  
 Page 2 of 4

**Forecast Year 1**

Do Minimum Forecast Year 1

Run from remote location

Run Folder Directory

---

Do Something Forecast Year 1

Run from remote location

Run Folder Directory

---

Forecast Year 1

DM Run ID

DS Run ID

Growth

**Economic Appraisal Tool**  
 RMS Appraisal Tools Suite

If true then Skims process will be run for this forecast year.

If true then CUBE will look for input files in location specified.

Catalog\Runs\Year\Run

---

Catalog\Runs\Year\Run

00

DM Run ID

DS Run ID

Growth

Save
Close
Next...
Back...
Run

Year must be in format YY, if no Forecast Year 1 then 00 should be used as placeholder.

Figure 5.5 CUBE keys page 2







## Keys Setup

Page 3 of 4

**Forecast Year 2**

Do Minimum Forecast Year 2  
 Run from remote location

Run Folder Directory

---

Do Something Forecast Year 2  
 Run from remote location

Run Folder Directory

---

Forecast Year 2	<input style="width: 600px;" type="text" value="00"/>
Do Minimum Forecast Year 2 RunID	<input style="width: 600px;" type="text" value="DM Run ID"/>
Do Something Forecast Year Run ID	<input style="width: 600px;" type="text" value="DS Run ID"/>
Growth	<input style="width: 600px;" type="text" value="Growth"/>

Save Close Next... Back... Run

Figure 5.6 CUBE keys page 3







**Keys Setup**  
Page 4 of 4

**Forecast Year 3**

Do Minimum Forecast Year 3

Run from remote location

Run Folder Directory

---

Do something Year 3

Run from remote location

Run Folder Directory

---

Forecast Year 3	<input style="width: 95%;" type="text" value="00"/>
Do Minimum Forecast Year 3 RunID	<input style="width: 95%;" type="text" value="DM Run ID"/>
Do Something Forecast Year 3 Run ID	<input style="width: 95%;" type="text" value="DS Run ID"/>
Growth	<input style="width: 95%;" type="text" value="Growth"/>

Figure 5.7 CUBE keys page 4



## 6 TUBA (Process 3)

### 6.1 Running TUBA Manually

This step assumes you have scheme files for each run you with correct file paths.

- 1) Open TUBA from the Start Menu
- 2) Under the start menu select *New* (figure 6.1)
- 3) Fill in the box with the relevant file paths and tick “Run one user class at a time” (figure 6.2)

If “Run one user class at a time” is not selected then the run will crash.

- 4) Click OK. If the scheme file and economic file are all correct the window will close. If not, a warning message will appear (see [Section 8](#)). If a warning message appears follow the following steps;
  - a. Click *View*
  - b. Select *Output*, this will open the .OUT file
  - c. Use the errors reported in the .OUT file to determine the error.
  - d. Repeat from step 2
- 5) Under start menu select *Save Batch As*
- 6) Save your run as a batch file somewhere easy to find. This will allow you to reload the run once complete or after a failure.
- 7) Select *Run > Run Now* (Figure 5.3)
- 8) **While running TUBA may appear as Not Responding. This is normal. Typical run times are shown in table 6.1 below;**

**Table 6.1 Typical runs times for TUBA for a 60 year appraisal period with 3 modelled years.**

	Typical Run Time				
Regional Model	ERM	WRM	SWRM	SERM	MWRM
Run time	9hr 00mins	1hr 45mins	1hr 30mins	0hr 50mins	0hr 55mins

Note: These run times will vary based on the machine that is being used. For all runs at least 32 GB of RAM is recommended. For the ERM 64 GB of RAM is recommended. However, if this is not possible, 32 GB of RAM would work too; the run would just take longer. All these runs were done on a laptop with 32 GB of RAM.



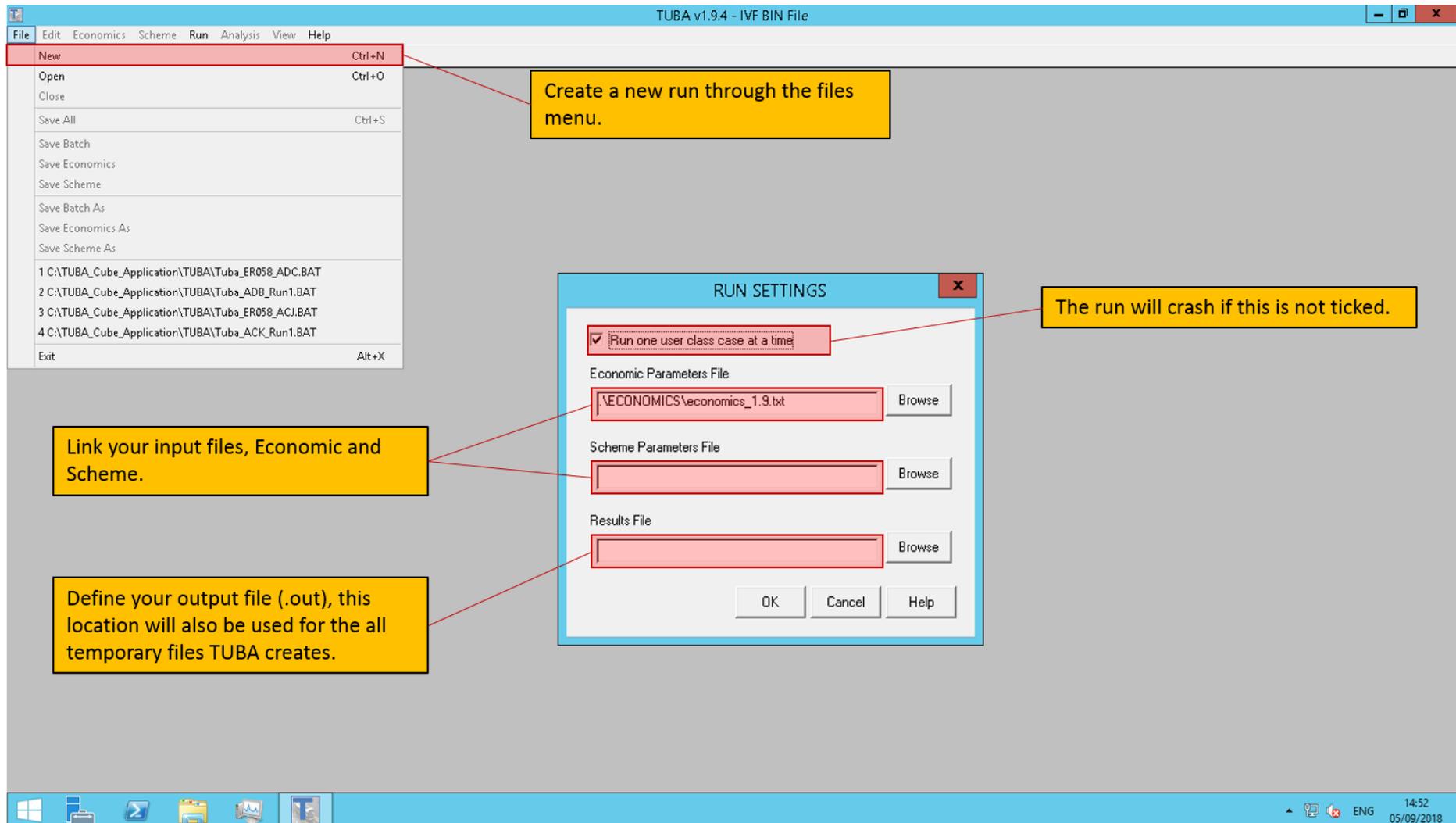


Figure 6.1 Creating a new run in TUBA



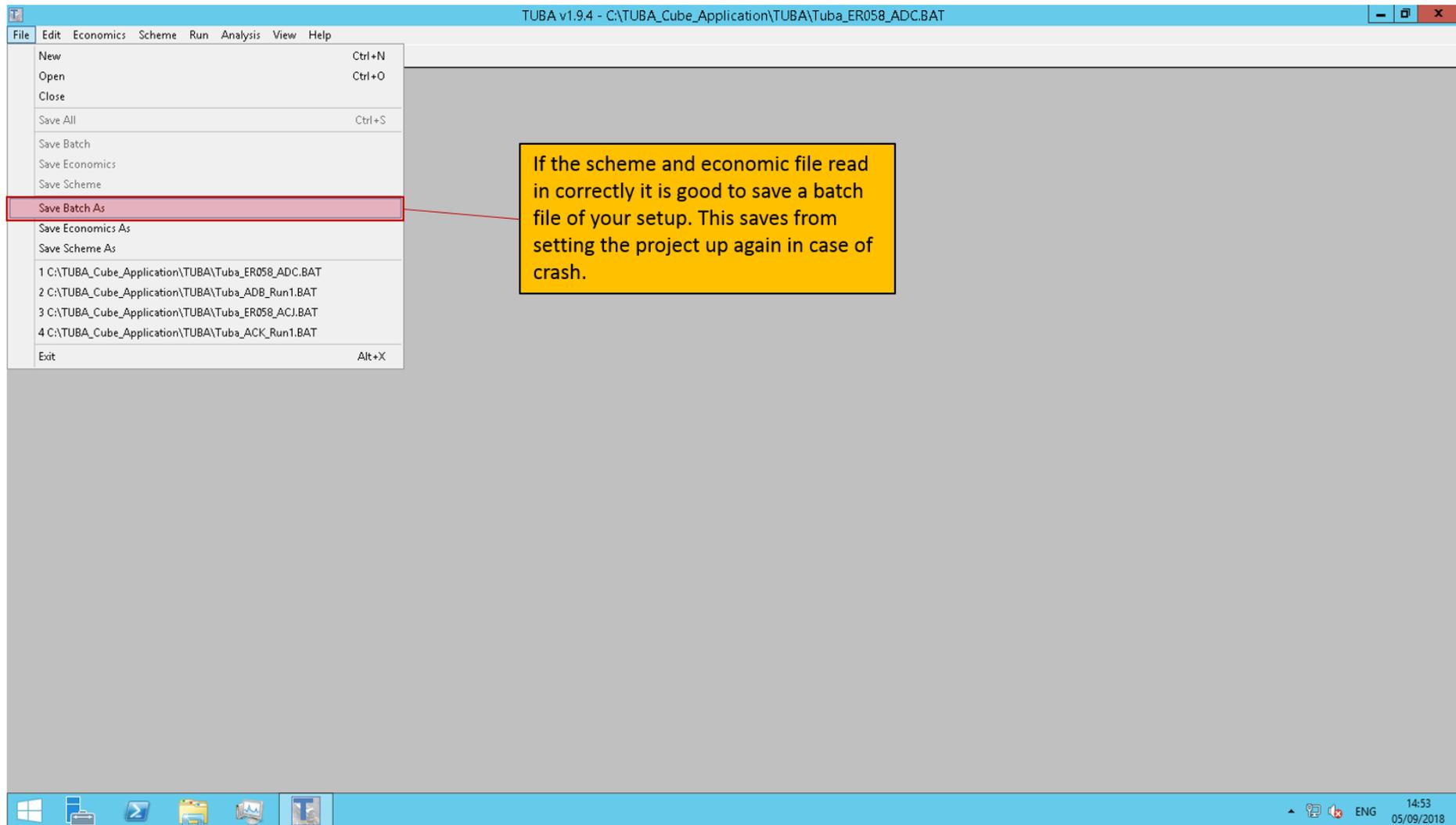


Figure 6.2 Saving batch file in TUBA



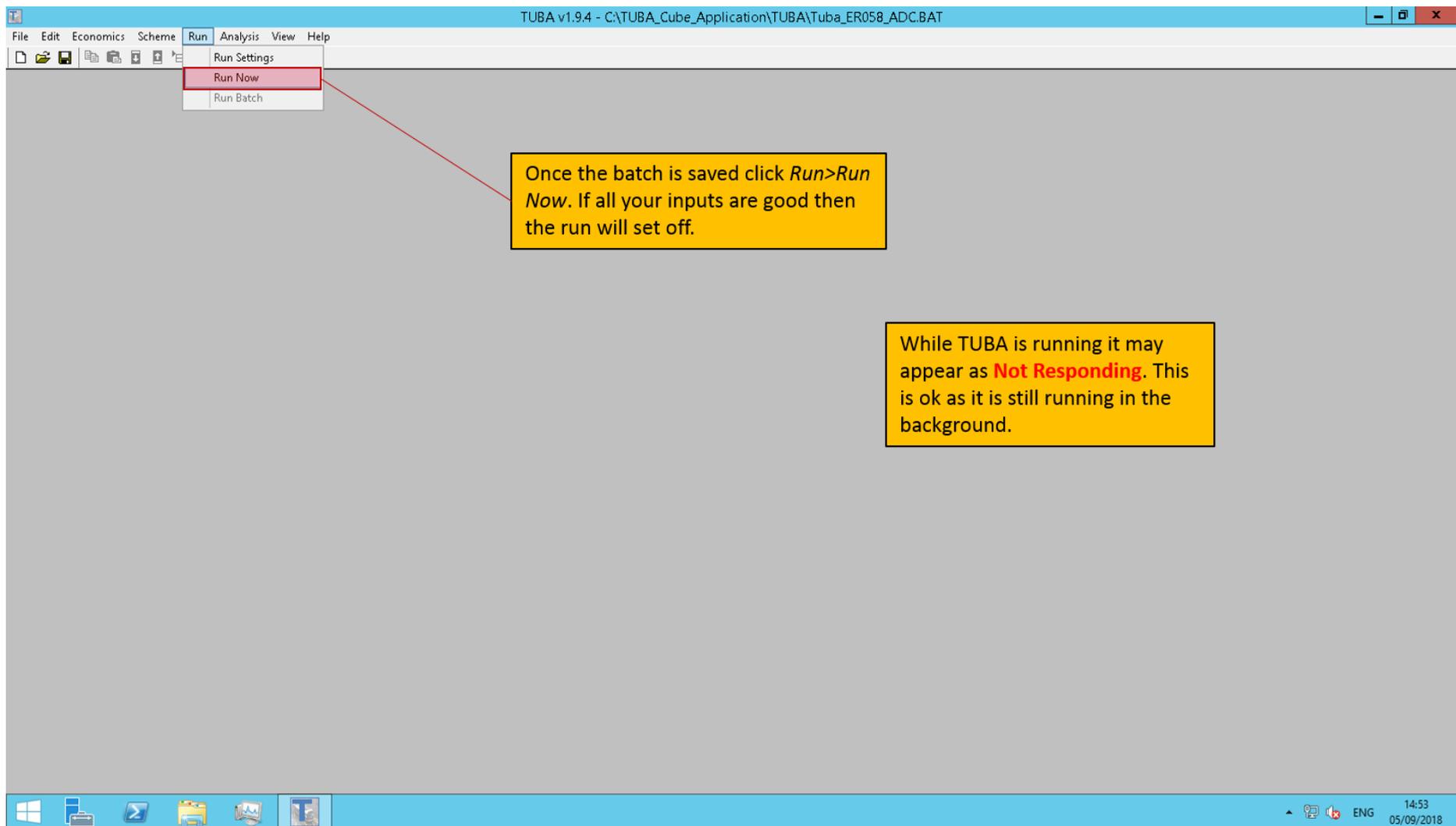


Figure 6.3 Launching a TUBA run



## 6.2 Detailed Results Extractions

TUBA will automatically produce a .OUT file. At the end of this document you will get a TEE table (Transport Economic Efficiency) which contains the total benefits, costs and BCR see figure 6.4 below for an example;

Broad Transport Budget	1673959
Present Value of Costs (PVC)	1673959
OVERALL IMPACTS	
Net Present Value (NPV)	4621676
Benefit to Cost Ratio (BCR)	3.761

**Figure 6.4 Example of .OUT file with BCR**

To extract detailed outputs, benefits by sector, follow the steps below.

This is required to use the TUBA analyser

If TUBA was closed follow these steps first;

- 1) If TUBA has been closed open TUBA
- 2) Select *File > Open*
- 3) Select the batch file for the run and open it

If TUBA was not closed start from here;

- 4) Select *Analysis > Export Data* (Figure 6.5)
- 5) In the pop-up box select the year required for analysis. If left as “All” the output CSV will contain every year making the file very large.
- 6) Specify the location to save the export CSV
- 7) Click OK. Depending on the size of the data you are exporting this can take time. Table 6.2 below gives a guide to the output file size.

**Table 6.2 Approximate file sizes for detailed outputs**

Number of Sectors	Number of Rows per Year	Approx. File Size per year
10	5,200	20MB
20	20,800	100MB
30	46,800	230MB
836 (WRM Zones)	36,342,592	75GB
1953 (ERM Zones)	198,338,868	150GB



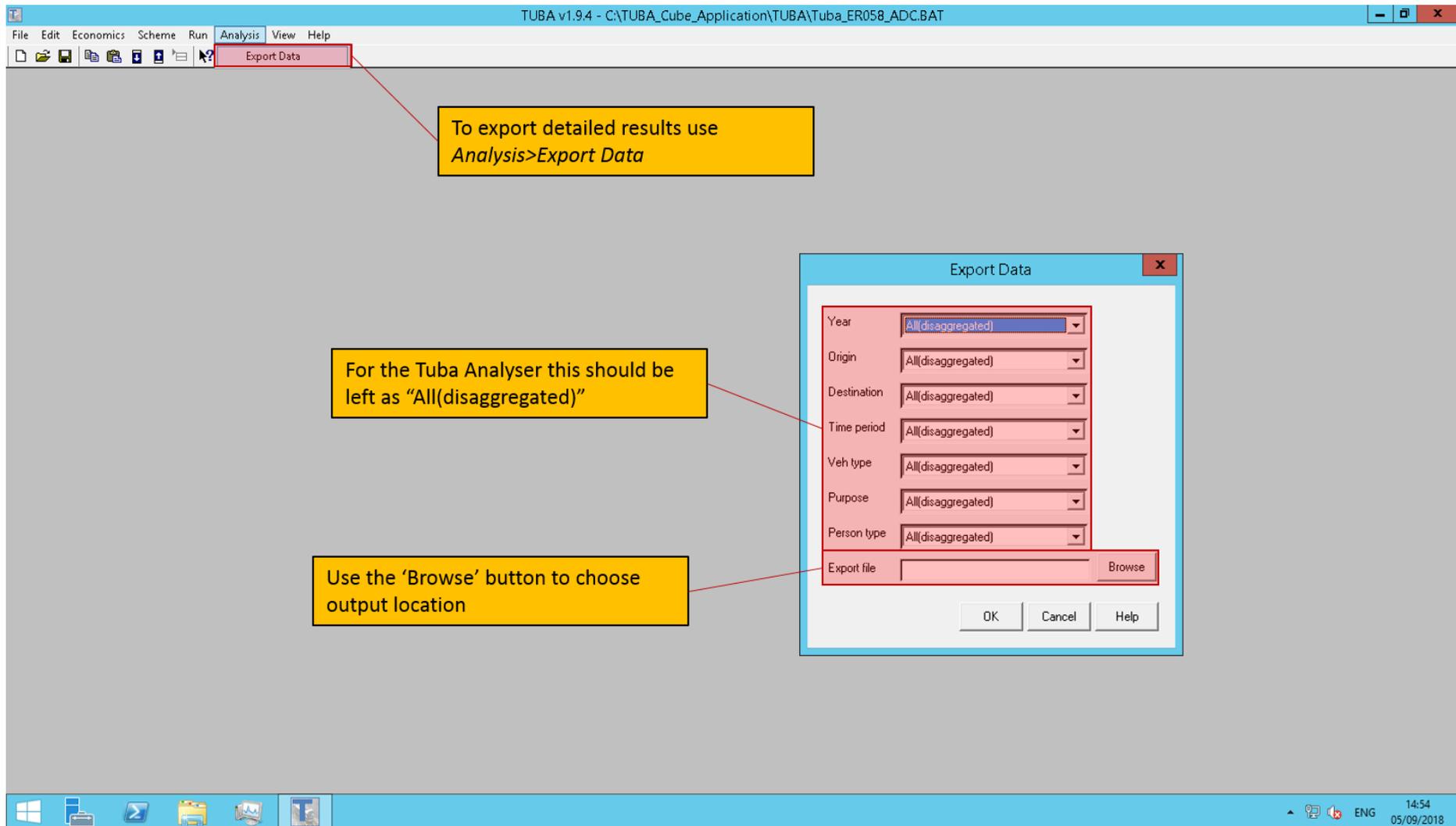


Figure 6.5 Extracting detailed outputs from TUBA



## 7 TUBA Analyser (Process 4)

The TUBA Analyser spreadsheet can be used to filter the sector to sector results of a TUBA run to reduce noise or focus on one particular area. The process to use the TUBA analyser is set out below;

- 1) Copy the latest version of the TUBA Analyser to your local C Drive from the main toolkit folder.

Running the TUBA Analyser from the network is not recommended due to the size of the spreadsheet. Note: it currently has a limit of up to around 35 sectors for a 60 year appraisal.

- 2) Open the workbook and enable macros
- 3) Fill in the “Inputs” tab
- 4) Click “Clear all Data Inputs”
- 5) Click “Click Here to Get Data”

.OUT File Path	C:\DART_TUBA\CubeProgram\TUBA\Outputs\AAS_Run2\
.OUT File name	AAS_AAR_Run_2.OUT
Detailed CSV results path	C:\DART_TUBA\CubeProgram\TUBA\Outputs\AAS_Run2\
Detailed CSV results file name	AAS_AAR.csv
<div style="display: flex; justify-content: space-around; margin-top: 10px;"> <div style="border: 1px solid black; padding: 5px; background-color: yellow;">Click Here to get Data</div> <div style="border: 1px solid black; padding: 5px; background-color: yellow;">Clear All Data Inputs</div> </div>	
Errors in running macro:	Macro last run on 12:53:38 21/06/2017

File paths need to include “\” at the end

Figure 7.1 Input tab of TUBA Analyser

- 6) On the “Readme” tab complete the Spreadsheet Options box. Filtered option shown below in Figure 7.2 is covered in step 7.

SPREADSHEET OPTIONS

SELECTED RULE FOR OUTPUT SHEETS

Filtered

Clear All Data Inputs

Discard sector to sector benefits less than this filter value

1

Select Time Period for Sectorred Benefits

All

The filtered option applied the filter set by the user to remove certain sector to sector movements from the TEE table

This option allows the user to specify a minimum value of benefit to include a sector in the TEE table

If desired a single time period can be selected for the filtered TEE table

Figure 7.2 Spreadsheet Options table from Readme tab of TUBA Analyser



- 7) Fill in the “Rule Specification” tab, where 1 includes the benefits between two sectors and 0 excludes it.

		Sector 1	Sector 2	Sector 3	Sector 4	Sector 5
		1	2	3	4	5
Sector 1	1	1	1	1	0	0
Sector 2	2	1	1	1	0	0
Sector 3	3	1	1	1	0	0
Sector 4	4	0	0	0	0	0
Sector 5	5	0	0	0	0	0

Figure 7.3 Example of Filter Matrix in Rule Specification tab of TUBA Analyser

- 8) The results based on the rules specified will be displayed on the tabs;
- **TEE Filtered** – A recalculated TEE table excluding any sectors marked for exclusion on the Rule Specification, less than the minimum value or outside the time period.
  - **TEE Unfiltered** – The original TEE table taken from TUBA

## 8 Troubleshooting

In all cases the print files (.prn for CUBE and .OUT for TUBA) will provide the best clues as to why the run has not worked.

PROBLEM SOFTWARE	PROBLEM	SOLUTION
TUBA	TUBA reports error “Parameters Table Missing”	Scheme text file encoded in incorrect format, should be UTF-8
TUBA	TUBA reports error “Data Repeats”	Tick box under Scheme options to run one user class at a time
TUBA	Dynamic Memory Error	Tick box under Scheme options to run one user class at a time
TUBA	TUBA closes without completion or error message	You have insufficient storage space to continue the assessment
TUBA	No export outputs option	Ensure that "Detail" in the scheme file is set to “Yes”
CUBE	F(222): FILEO PRINTO[1] specified 2 times.	Run all steps prior to Loop manually and then start CUBE run from skims loop
CUBE	ConsoleApplication1 has stopped working	Incorrect Seq_2_Hier.exe in the Params folder, change for the correct .exe for your regional model
CUBE	Program crashes during Highway Skims but does not specify missing or problematic files	Incorrect Zone number entered, CUBE has either underrun or overrun the matrix.



PROBLEM SOFTWARE	PROBLEM	SOLUTION
TUBA	TUBA says a column does not add up to 100%	Check the sums of the cost profile columns and ensure they all add up to 100%
TUBA	Dynamic memory problem	<p>This can occur for several reasons. To solve this, try the following steps:</p> <ul style="list-style-type: none"> <li>• Make sure there is around 30 – 70 GB of hard disk space free depending on the regional model that is being run.</li> <li>• Close other programs to release RAM during the TUBA run.</li> <li>• Defragment the hard drive if it is close to being full.</li> <li>• Check that the page system file is set to “Automatically manage paging file size for all drives”. Do this by following the following steps below:               <ul style="list-style-type: none"> <li>○ Press Windows Key + Pause Break from the keyboard to open the System Properties. Then choose ‘Advanced System Settings’ in the left pane and then click on the ‘Settings’ button in the ‘Advanced’ option.</li> <li>○ In the ‘Performance Options’ window, go to the ‘Advanced’ tab and then click ‘Change’.</li> <li>○ The box saying ‘Automatically manage paging file size for all drives’ should be ‘checked’. If it has been set manually, then the maximum size needs to be increased.</li> <li>○ Click 'OK' and then click 'OK' again.</li> <li>○ Now, Click 'OK' twice to close the 'Performance Options' and 'System Properties' window.</li> </ul> </li> </ul>



PROBLEM SOFTWARE	PROBLEM	SOLUTION
		○ Click 'Restart now' to apply the changes.

If the problem cannot be resolved from the print files or troubleshooting table please email [ntamodel@nationaltransport.ie](mailto:ntamodel@nationaltransport.ie) to get technical support.

If you have any feedback on the NTA Toolkit operation or documentation please also contact the above.



## 9 Appendix A – Files and directories

### 9.1 Input files and directory

An update has been made to the tool based on the latest supplied structures of the directories for the runs of the models. The latest structure is {CATALOG\_DIR}\\Runs\\(Region)\\(Year)\\(Scenario)\\ 4\_Outputs\_(Region)\_(Year)\_(Growth Scenario)\_(Scenario)\_Input\_(Version number). The {CATALOG\_DIR} is user-specific (usually on C: Drive). An example of the path and the variables that were used to test the model for one run are presented below:



{CATALOG\_DIR} = C:\NTA\AppraisalTools\Economic

{Region} = ERM

{Model Year} = 20

{Run ID} = Metro1

The input folder contains 3 subfolders. The first folder is the Appraisal Tools folder. The other two folders are the PT and Road folders, in which the time periods and the run files are assumed to be. The complete list of input files needed to run the tools are listed below. (These are assumed to be the same files as were required for V2 of the model, but they are listed here as well).

Please note: the folder structure must be created before the run.

#### Input files required from the RMS model - PT:

- AM\_PT\_EMP.MAT for each {Run ID},{Growth} and {Model Year} combo
- AM\_PT\_COM.MAT for each {Run ID},{Growth} and {Model Year} combo
- AM\_PT\_OTH.MAT for each {Run ID},{Growth} and {Model Year} combo
- AM\_PT\_EDU.MAT for each {Run ID},{Growth} and {Model Year} combo
- AM\_PT\_RET.MAT for each {Run ID},{Growth} and {Model Year} combo
- PT\_AM\_{Run ID}{Growth}{Model Year}.PTM
- LT\_PT\_EMP.MAT for each {Run ID},{Growth} and {Model Year} combo
- LT\_PT\_COM.MAT for each {Run ID},{Growth} and {Model Year} combo
- LT\_PT\_OTH.MAT for each {Run ID},{Growth} and {Model Year} combo
- LT\_PT\_EDU.MAT for each {Run ID},{Growth} and {Model Year} combo
- LT\_PT\_RET.MAT for each {Run ID},{Growth} and {Model Year} combo
- PT\_LT\_{Run ID}{Growth}{Model Year}.PTM
- SR\_PT\_EMP.MAT for each {Run ID},{Growth} and {Model Year} combo



- SR\_PT\_COM.MAT for each {Run ID},{Growth} and {Model Year} combo
- SR\_PT\_OTH.MAT for each {Run ID},{Growth} and {Model Year} combo
- SR\_PT\_EDU.MAT for each {Run ID},{Growth} and {Model Year} combo
- SR\_PT\_RET.MAT for each {Run ID},{Growth} and {Model Year} combo
- PT\_SR\_{Run ID}{Growth}{Model Year}.PTM
- PM\_PT\_EMP.MAT for each {Run ID},{Growth} and {Model Year} combo
- PM\_PT\_COM.MAT for each {Run ID},{Growth} and {Model Year} combo
- PM\_PT\_OTH.MAT for each {Run ID},{Growth} and {Model Year} combo
- PM\_PT\_EDU.MAT for each {Run ID},{Growth} and {Model Year} combo
- PM\_PT\_RET.MAT for each {Run ID},{Growth} and {Model Year} combo
- PT\_PM\_{Run ID}{Growth}{Model Year}.PTM

Input files required from the RMS model - ROAD:

- ROAD\_Skims\_AM\_{Run ID}{Growth}{Model Year}.MAT
- ROAD\_AM\_{Run ID}{Growth}{Model Year}.HWM
- ROAD\_Skims\_LT\_{Run ID}{Growth}{Model Year}.MAT
- ROAD\_LT\_{Run ID}{Growth}{Model Year}.HWM
- ROAD\_Skims\_SR\_{Run ID}{Growth}{Model Year}.MAT
- ROAD\_SR\_{Run ID}{Growth}{Model Year}.HWM
- ROAD\_Skims\_PM\_{Run ID}{Growth}{Model Year}.MAT
- ROAD\_PM\_{Run ID}{Growth}{Model Year}.HWM



## 10 Appendix B – Model machine matrix

Model Machine	NTA-Mod-01	NTA-Mod-02	NTA-Mod-03	NTA-Mod-04	NTA-Mod-05	NTA-Mod-06	NTA-Mod-07	NTA-Mod-08	NTA-Mod-09	NTA-Mod-10
Cube Version	6.4.2	6.4.2	6.4.2	6.4.2	6.4.2	6.4.2	6.4.2	6.4.2	6.4.2	6.4.2
TUBA	1.9.4	1.9.4	1.9.4	1.9.4	1.9.4	1.9.4	1.9.4	1.9.4	1.9.4	1.9.4
<b>Economic Module</b>	x	x	x	x	x	x	x	x	x	x

The table above shows which NTA model machines can currently run the Economy Module. At the time of writing the NTA are obtaining the latest version of TUBA 1.9.14 to work with the latest version of the tool.

